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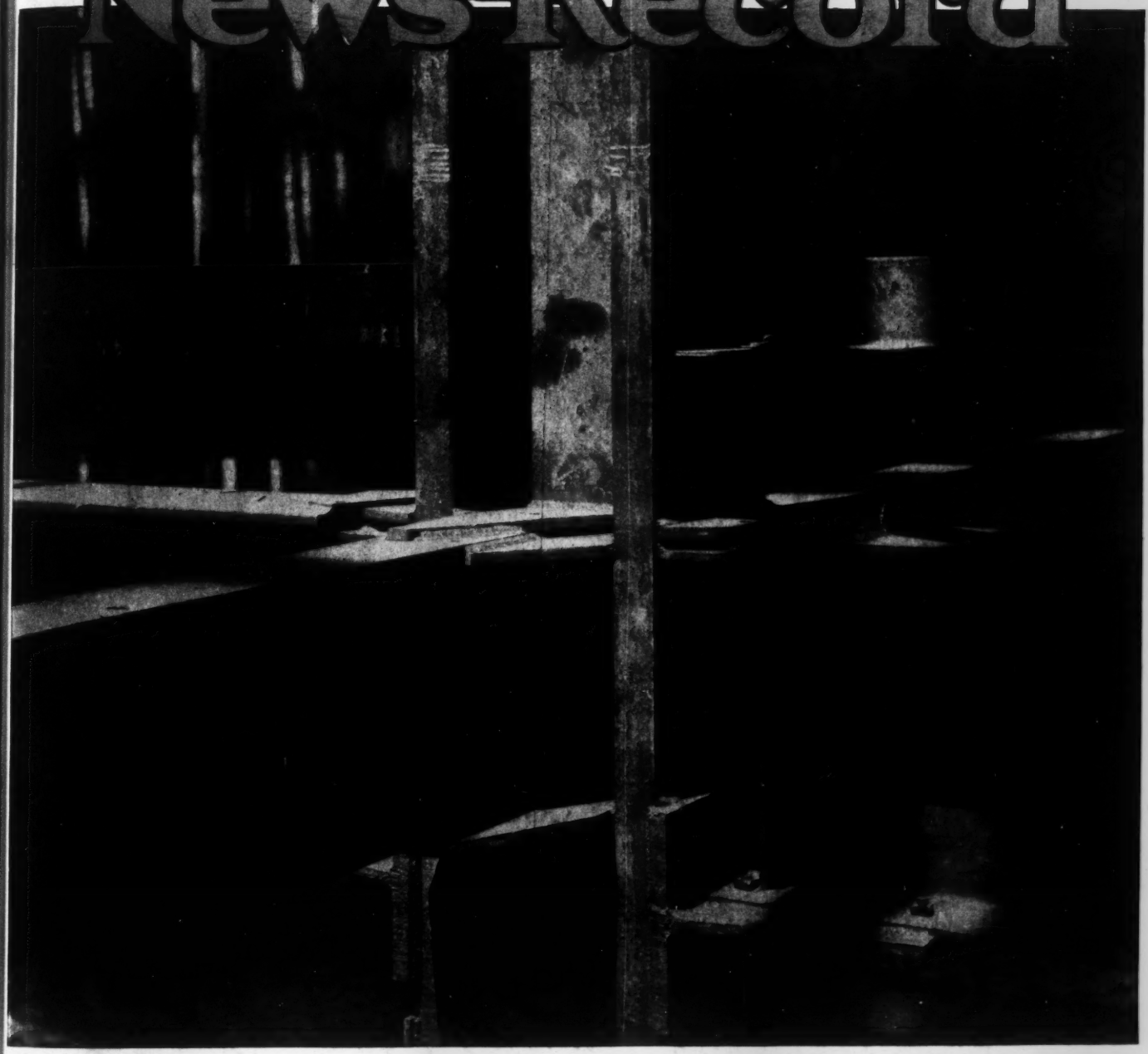

A MODERN BEAM-TO-COLUMN CONNECTION

With the advent of welding into the office building field, as exemplified by a 19-story building in Dallas and one of 14 stories in Boston, weld design and inspection assume added importance. As emphasizing this importance a feature of this issue is a group of

Six Articles on Structural Welding

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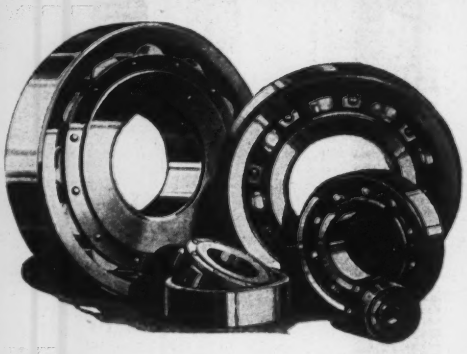

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ENGINEERING NEWS-RECORD

A McGRAW-HILL PUBLICATION — ESTABLISHED 1874

DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

F. E. SCHMITT, *Editor*

Volume 105 NEW YORK, SEPTEMBER 18, 1930 Number 12

Professional Unionism

SEVERAL instances of assault on members of the Technical Engineers, Architects and Draftsmen's Union for failing to pay recently increased dues occurred in Chicago during the past week. Assaults of this character unfortunately are not uncommon elsewhere, but what brings the present instance forcibly to attention is the fact that the membership of this organization is made up entirely of the engineering employees of the city. The union, now about five years old, was formed to further the personal interests of the city's engineering employees, and soon succeeded in having the whole salary scale raised. Some months ago, by what some of its members consider questionable procedure, it voted to raise the annual dues by one-third. Many employees declined to contribute the increase, and the assaults followed. They bring out in grotesque relief the incongruity of attempting to combine the concepts of profession and union.

Knowledge Lacking

ONLY by a narrow margin did the cyclonic storm which devastated Santo Domingo miss striking the United States. By that same margin we escaped large-scale destruction, for we have the strongest reason to believe that our own structures would not have resisted much more than those of the ill-fated West Indian towns. Florida's experiences in 1926 and 1928 told us convincingly that our security is just as much at the mercy of the great hurricanes as though we lived in primitive conditions. And since that time practically nothing has been done in the way of establishing a stronger and better building practice. Little can be done, in fact, so long as we continue to know almost nothing about the forces exerted by great storms. No measurements of storm force have been made or means provided to do so in future storms. Winds continue to be measured in miles instead of in pounds, and often indeed in fictitious miles; and the best skill of scientists still gives us nothing better to assure public safety against wind violence than delicate observations on bodies falling in still air or equally delicate spinning-table or wind-tunnel measurements of the action of quiet air streams. The immense turbulence of storm movements remains a sealed book, and so for the present our only safeguards against storm destruction must rest on empirical judgment without support from scientific observation.

Expensive Economy

ENGINEERS charged with bridge maintenance should need no reminder of the necessity for frequent and competent inspection of old structures; yet there are indications that in some cases this duty becomes dangerously perfunctory. Many bridges now in service, on both railroads and highways, are subjected to loads far in excess of those considered in the original design. This cannot be avoided, for it is economically impossible to replace all of these structures immediately; yet the injury caused by frequent overloading and the progressive weakening due to corrosion, to name only two possible hazards, make it essential to regard all overtaxed bridges with constant suspicion, and to exercise every effort to detect the first signs of distress. Inspection intrusted to a construction foreman, a road patrolman or some other employee with little or no technical knowledge of bridge design cannot properly detect or evaluate dangerous conditions. Even under more competent scrutiny the need for repairs is often glossed over because of the inspector's knowledge that an unfavorable report will receive anything but a cordial reception at a headquarters already worried over scanty funds for new construction. Under such circumstances it is not surprising that the optimism of the inspector sometimes outweighs his caution—a tendency which sooner or later results in disaster. It takes only one bridge accident, with its attendant consequences of damage suits and interrupted traffic flow, to demonstrate that too conservative a policy on bridge inspections and repairs is false economy of the worst kind.

Highway Grade Separations

FROM a traffic viewpoint the separation of highway grades at the intersections of main thoroughfares often is of more importance than the separation of highway and railway crossings because of the number of units involved. For evidence of the need of separation one has but to look in regions surrounding our large cities where major radical lines intersect circumferential routes. Cook County at Chicago is a good example. Agitation for highway grade separation on the county roads began there in 1927 and exhaustive studies were made by a committee of the Chicago Association of Commerce, studies which consumed one and one-half years. After a decision was reached as to the first point of attack acquisition of right-of-way took an equal period because of the opposition of local property owners. But late in August work was begun in earnest at the intersection of Milwaukee Ave. and Dempster St. Dempster St. is to be carried as a depressed thoroughfare 44 ft. wide under Milwaukee Ave., Milwaukee Ave. remaining at its present grade. Service drives will be provided alongside of the depression to allow for turning movements. Contractors will not take as long with their part of the work as did the acquisition of right-of-way, and then Cook County will have a concrete example for use in urging the elimination of the 35 other major intersections laid out by the citizens' advisory committee of the county board. Impetus to the elimination movement is given by the progressive widening of most arteries from 20 to 40 ft., thus adding to congestion in the bottleneck created by grade crossings of important highways.

The public has been slow in learning to weigh the value of highway grade separations against railway grade separations where money is not available for both. What is being done in Cook County and in other metropolitan districts soon will alter that condition. Both speed and safety are involved.

Silence and What Else?

THE advent of welding in tier buildings, as exemplified by several articles in this issue, raises an important question. Is it economical? This question perforce is paramount, since the reliability and practicability of welding has been adequately proved and widely accepted. In mill buildings, where structural welding has enjoyed its largest use, considerable savings have been effected by simplified design in plate girders and elimination of gusset plates in roof trusses. In beam-and-column buildings, however, the saving is not so tangible. Perhaps it is just as real, but the burden of proof is on the proponents of welding. Granting the reduction in noise over riveting, and granting the value of this reduction, are there other advantages? Until we know that other advantages exist, or perhaps do not exist, it is not possible to weigh the two available methods of structural steel jointing either fairly or efficiently. Manufacturers of equipment and supplies, public utility companies and others interested in the growth of welding, are doing the engineering profession a remarkable service by the manner in which they are backing their beliefs with buildings. They can immeasurably increase this service by making costs and time schedules available. With the fall convention of the American Welding Society only a few days off, it is pertinent to ask: What besides comparative silence does welding offer to prospective builders and designers of beam-and-column structures?

Multiplied Labor

NOT long ago George A. Orrok said, in an article written for our pages, "Man's productive capacity is fifteen times what it was at the beginning of the century and about fifty times his unaided individual effort." A few days ago Prof. Joseph W. Roe increased this estimate in a public address, saying, "For every man, woman and child in America there is generated power equal to that of a hundred slaves." That the two estimates do not agree is unimportant, and more or less inevitable, for we have no exact measure of the precise working capacity of the human machine nor can we set up complete and correct figures for the total amount of power machinery in the country. But the broad truth expressed by either estimate is so profoundly important that it deserves to be brought to public notice again and again, in order that it may have full opportunity to influence the world's thought and philosophy. The bare fact of power service means that the individual today is no longer an individual; he is leader and commander of a large troop of invisible men, and his ability to plan determines the effectiveness of the group. So rapidly are these relations progressing still farther that the troop of fifty or more invisible attendants increases its number each year, and becomes doubled in barely five or six years. It is clear that the functions of men must change greatly in the course of this growth. With the change in function comes a growth and development of responsibilities, and a continual transformation of the relations between men that still await adequate appraisal.

Looking Ahead

SUMMER is over. A dull, disagreeable season has gone and the fall months are at hand, suggesting new activity and the approach of winter. They are always a season for looking ahead, but this year most strongly so. We are in the midst of unusual conditions which dictate special planning and constructive action.

The depression that has prevailed for months is largely still with us, but there are stirrings of new life. Observers of the business skies see many favorable portents and foretell an upturn, not the normal fall recovery but a climb to revised production and trade. Though their predictions lack the force of mathematical proof, yet it may be asserted with confidence that the upturn is delayed only by doubting hesitancy and that aggressive courage would quickly make it an unmistakable reality. Our own belief is that the rise is inevitable and that in turn it will soon build new courage. Planning and action, however, are needed whether business increases or remains sluggish, for the pressure of competition will operate in either event. What does it mean to construction?

First as to the present situation. General business has seen decrease in production and associated trades down to a hand-to-mouth minimum. Consumer demand, though also decreased, has in most lines kept at relatively higher level. Stocks available for distribution have declined seriously and just now are much below normal. Ample credit has not changed these conditions. Prices meanwhile have dropped, reaching their bottom a month ago and now are ready to turn upward.

The field of construction presents a different picture. Heavy construction remains and still continues very active, public works even going to exceptional levels and setting some new records of speed and volume. Home building, on the contrary, is exceptionally down and the housing supply no longer has much margin. Material prices declined slowly. Labor rates did not decrease generally, but higher efficiency of labor has brought down costs.

Thus the facts that bear on the immediate outlook are depleted commodity stocks and bottom prices. In construction there is assurance that public works will continue at peak volume and industrial construction at a fair rate, that home building must soon be resumed and that prices will trend slowly upward.

A program of action to take advantage of these conditions involves, first, a liberal stocking up with material and if feasible improved equipment at low prices; second, improvements of efficiencies both in method and in management; third, development of new product process and application range by research. The competition of the immediate future will set narrower margins than have long prevailed. It may bring new forms of demand by clients and purchasers who themselves are subject to competitive pressure. In part it will be a competition of time and deliveries in which those will prevail who are best prepared.

These program essentials apply most broadly to general industries and commerce. But though construction is active, they apply to it also. Business is too closely interrelated to warrant such an exception; the same currents affect all its departments. The planning policy of the construction industry cannot differ fundamentally from that of other industry or business.

These program essentials have obviously different meaning for different branches of the industry and their

effective application depends on how fully their importance is understood. The contractor, for example, will find occasion to give more intensive attention to construction planning for excellence and speed as well as economy and to putting his equipment into most efficient condition. The builder of machines will have major opportunities in creation of new types to meet higher demands of field construction and in overhauling organization and production system aside from fullest stocking with raw material. Materials producers may profit by modernization of plant and process, improving control of quality and grading and study of new varieties and forms of products. In each case, however, let it be borne in mind that the coming months carry a promise and a threat—the promise of revivified business and the threat, whether or no this promise is fulfilled, of more severe demands, closer competition and sharpened specifications of both quality and time. Each department and unit of construction is confronted by them. Those only will prosper who prepare.

Serious Charges

ENGINEERING practice in contracting levee construction on the Mississippi River is gravely criticised by a contractor writing in this issue. Censure is directed particularly against two things: first, engineering planning and supervision which favors construction by hired labor, and second, failure of the working organization on the river to promote and execute the contracting policies of its directing head in the office of the Chief of Engineers. It is contended that competition is unfair, information to contractors defective, and estimates deceptive. The accusations are pointed and build up an indictment of the engineers immediately directing the river work which is too serious to be overlooked. Virtually the engineers on the river are charged with unduly biased if not unethical conduct of their work.

It is axiomatic that any procedure which neglects to give all available information by which construction can be planned, or which presents plans so imperfect that the bidder cannot make sound estimates, or which fails to allow a reasonable period for the bidder to determine this information for himself, is not good engineering. If also the engineer, in bidding against the contractor, plans the work definitely to the advantage of his equipment and methods, or if in actual execution he favors the force-account job by not observing the specifications or by failing to apply the same exacting supervision that he enforces on a contractor, his action is biased beyond any recognized privilege of professional judgment. These actions are definitely implied in the article under discussion.

In its basic nature this is not new matter. Biased specifications and arbitrary supervision have long been a standing complaint of levee contractors. Many specific instances have been brought forward to support the complaint. However, distinct improvement has come about during the two years since the new levee project has been in progress. Specifications and administrative policies have been made more liberal by many changes which contractors have desired. Today contractors building levees by dry-fill methods stand in a much better position than they did and have greater hope that the remaining differences will be arbitrated. The present charges, nevertheless, are grave, for they refer to the emergency flood-control project, a work that is so large and makes such imperative demands for utmost efficiency as to render intolerable any continuance of discriminatory or oppressive practices.

Long-standing opposition between the contracting policy and the force-account policy is at the bottom of the trouble. The force-account policy bears injuriously on levee engineering because it places an inhibition on ingenuity and invention in construction methods. That the policy denies to contractors profitable work is only incidental, so far as the present discussion is concerned. Day-labor construction on the Mississippi was in fact a necessary development. In the older days of the mule-team levee it was necessary to provide for emergency construction and to obtain a measure of construction costs as a check on contract prices. Later, in the large-machine levee period, it was necessary because contractors generally would not venture large plant investment under the uncertain employment of such costly equipment. The outgrowth was natural and logical.

Through this development the river engineers became not only a planning and directing body but a construction organization. They increased their plant to control virtually all of the large-machine levee operations and largely arrogated to themselves construction rights and the privilege of selecting their operations. From this, however, certain damaging results followed: Thinking became tied to the processes and equipment in use; levee construction was looked upon as a government prerogative, and contracting merely as an agency for disposing of undesired remnants; restrictions and dogma came into existence and crystallized.

So much has been said of hired-labor levee building because it is the origin of most of the troubles that affect levee engineering on the Mississippi. It has built up an attitude of mind that is reluctant to consider new thinking and encourage change—indeed, that regards the organization on the river in the light of a close corporation having all the rights and ability in constructive thinking. Lack of data offered bidders, arbitrary exercise of supervisory power and the minor exactions in specifications of which contractors complain are directly the result of this habit of mind. It is not universal on the river; there are engineers who carry their thought and speculation beyond, but the creed controls policies and practices.

There has been a measure of revision of levee engineering practice with the new project, brought about by the greater volume of contract work and the development of new devices for construction. This improvement has, however, been confined largely to more liberal specifications and supervision. Levee planning presents no change in the basic thought given to design and location. This adherence to precedent hampers today the full development of hydraulic-fill levee building.

The logic of conditions makes construction by contract the controlling policy of the present-project levee construction. The river engineers cannot, even if they should so wish, undertake to extend their organization and plant to perform all major construction. They must replan completely for contract construction. Hired-labor levee construction has served all its possible purpose as a controlling policy. To perpetuate it will serve only to continue the influences that hamper freedom in developing progressive thinking in levee engineering, which should be first of all the function of the engineering organization on the Mississippi. It meanwhile has a serious indictment to answer in the charges made in the article in this issue, not because of this individual statement but because it expresses a large body of engineering and contracting opinion.

Welding Steel Structures

A Group of Six Articles Setting Forth Design, Erection and Inspection Practices on Some Recent Major Building Projects

THE USE of welded connections in steel building construction began in 1926 with the completion of a five-story building at the Sharon, Pa., plant of the Westinghouse Electric & Mfg. Co. Fusion welding had proved successful prior to this, but its use had been confined to laboratory tests and minor practical applications. The Sharon building was the first structure to be designed expressly to suit welded construction. Since that beginning, the art has progressed rapidly. Riveted precedents proved hard to forget at first, but original thinking has evolved until many of the connections now being used reflect design practice of a high order.

The first welded buildings have been built by the manufacturers of electric equipment and of the gases used with the oxy-acetylene process and by public utility companies. This is natural and logical, for these companies are in a position to benefit from a growth in the use of structural welding. Fortunately, they have attacked the problem with vision and with the best interests of the engineering profession in mind. Their efforts are now bearing fruit, and while not a great many welded buildings have been built by independent organizations, there are a few of note. Among these are the Homestead Hotel at Hot Springs, Ark., an eleven-story structure of 560 tons; a power house, 150 ft. high, for the Chalfonte-Haddon Hall Hotels in Atlantic City, N. J.; a four-story addition to the Rose Building in Cleveland; a six-story addition to the Ohio Valley General Hospital in Wheeling, W. Va.; a five-story court house at Norristown, Pa.; and the four-story Upper Carnegie office building in Cleveland. In addition, many cities have revised their building codes to permit the use of welding under proper supervision.

Welded buildings also have been increasing in height. The power house at Atlantic City and the hotel at Hot Springs referred to above have been followed by a fourteen-story field-welded building for the Southern California Edison Co. in Los Angeles and a similar structure for the Edison Electric Illuminating Company of Boston. In Pittsburgh, the Westinghouse Company has completed an eleven-story all-welded building. Structural welding in the past year has been climaxed by a nineteen-story all-welded building for the Dallas Power & Light Co.

With this continued activity, design and inspection problems are becoming of major importance. Mr. Vogel, of the General Electric Co., describes below a refined design method for weld proportioning that is a step forward. Professor McKibben and Mr. Carson treat some of the inspection necessities and practices. Erection, as well as design, is described in the articles on the Boston and Dallas buildings. The group of articles, which assumes added timeliness because of the meeting of the American Welding Society in Chicago next week, is completed by a description of a large area of welded steel floor, made possible by the development of automatic welding machines. —EDITOR.

I—Highest All-Welded Office Building Erected in Dallas

Nineteen-Story Dallas Power & Light Co. Structure Built With Arc-Welded Shop and Field Connections—Erected in Six Weeks

RISING 246 ft. above its foundations, the nineteen-story Dallas Power & Light Co.'s office building at Browder and Jackson Sts., Dallas, Tex., is the most recent as well as the highest welded structure yet completed. All field connections and all shop connections except those necessary in the fabrication of three large plate girders are arc-welded. Steel erection started July 18 and was completed Sept. 3, six weeks later, with one welding crew of five men always keeping within six floors of the erection gang and usually much closer. The entire steel framework (about 1,300 tons) was erected and welded complete before any masonry was placed in the walls or floor, a procedure permitted by the Dallas building code.

Building Design—The structure has nineteen stories above street level, twenty above foundations. Foundations are concrete pads resting on solid rock at basement floor level. The ground floor plan is 100x100 ft.; the fifth floor plan is 100 ft. by 77 ft. 4 in. with three 14x11-ft. corners out; the seventh floor is 96 ft. 6 in. by 77 ft. 4 in. with four 14x11-ft. corners out; the eleventh floor is the same with four 22x11-ft. corners out and the floors from the thirteenth to the nineteenth are 96 ft. 6 in. by 54 ft. in plan. Panels vary in size, averaging 25 ft. square. There is an intermediate pilaster column between main columns on all outside wall lines. All spandrels are off the center line of wall columns, the girder webs passing along the inside face of the columns with the girder flanges coped around the vertical members. Brackets cut from 18-in. beams are welded at approximately 6-ft. intervals along the spandrels. These brackets extend approximately to the building line and support a $\frac{3}{8}$-in. plate which will carry the inclosure masonry. Column lengths are two stories, except the top lift, which is three stories. Column base connections are two angles, 6x4x$\frac{3}{8}$, shop welded to each side of the column web with a 1-in. space between the bottom of the angles and the bottom of the columns. Each angle is connected to the base slab and the concrete footing by a single 1-in. diameter anchor bolt.

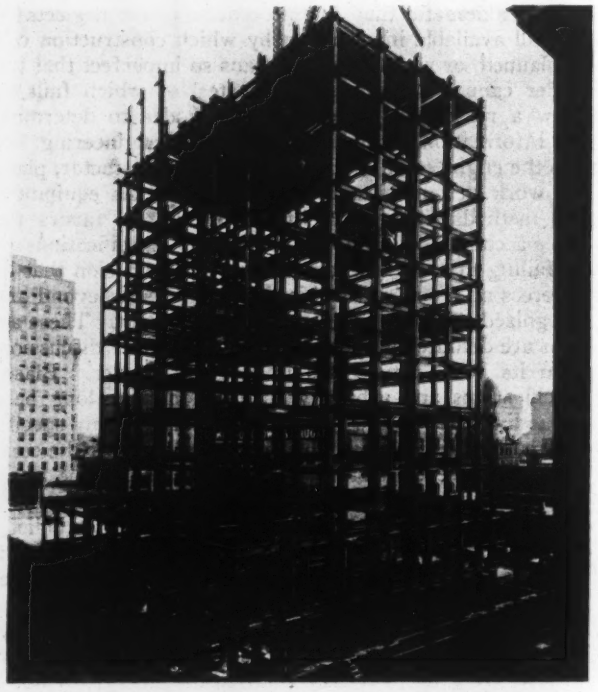


FIG. 1—ALL-WELDED NINETEEN-STORY OFFICE BUILDING, DALLAS, TEX.

The first floor averages 21 ft. above the foundation blocks. The first story is 21 ft. high; the second to fifth, 12 ft.; the sixth to seventeenth, 10½ ft.; and the top story is 21 ft. 8 in. in height.

Erection and Welding—All steel was fabricated at the contractor's plant in Dallas and trucked to the job. Erection was handled entirely by one guy derrick with an 80-ft. boom, utilizing an electric hoisting engine. During erection the intermediate pilaster columns were braced every two floors by angle struts bolted temporarily to the pilasters and to main interior columns, as shown in Figs. 2 and 3. These braces, placed about 2 ft. above floor level, will be removed as soon as the concrete floor arches have been poured.

The welded connections were designed to eliminate all overhead welding in the field and to permit all pos-

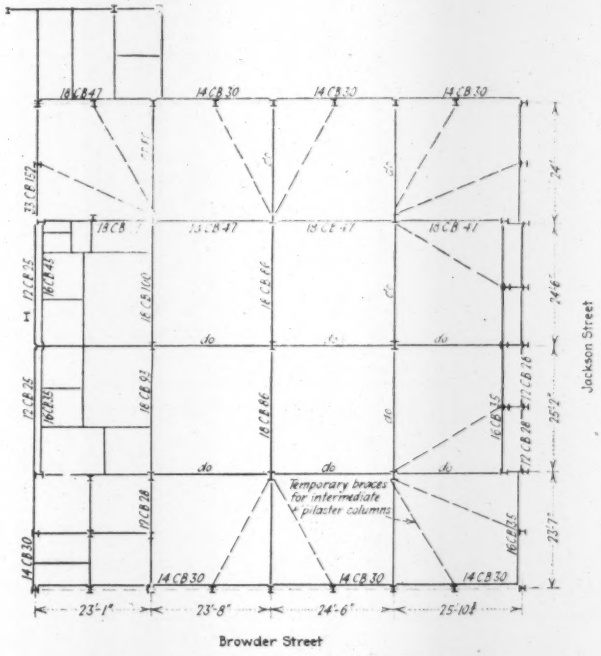


FIG. 2—TYPICAL FLOOR (THIRD) PLAN, DALLAS BUILDING

sible welding to be done in the shop. In general the floorbeams rest on the webs of flame-cut I-beam brackets welded to the flanges of the columns and on angle brackets welded to the column webs. Some of the I-beam brackets are reinforced by two small triangular plate brackets welded to the under side of the I-beam web. All of the connection brackets were shop-welded. The floorbeams, designed to take wind stresses, were connected by two plates, one, on the under side of the top flange, being shop-welded, and the other, on the top side of the beam, being field-welded. Clip angles between the column flanges and the beam webs were used for erection purposes.

The fascia girders, which, as stated, were coped so that the webs set against the inside face of the wall columns, were fastened to the columns by angles welded to the top flange of the girders and by vertical field-welds between the girder webs and outside

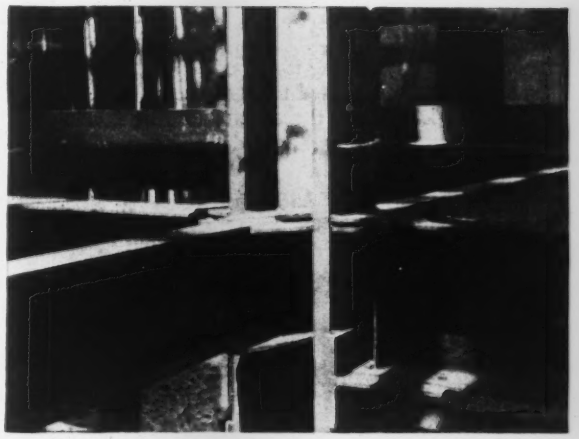


FIG. 3—SPLIT I-BEAMS ENTER THE WELDED CONNECTION FIELD
A typical wind connection on the Dallas building.

corners of the column flanges (shown in Fig. 5, left). Columns were spliced by plates welded to the outside of the flanges. The splice plates were shop-welded to the tops of the columns, the upper half of the plate being drilled with four bolt holes for erection purposes. Where columns changed size, filler plates were shop-welded in place. Enough holes were provided in all members for temporary bolted connections so the erectors could work ahead, independent of the welders. The steel framework was plumbed and squared by means of cables and turnbuckles, as shown in Fig. 6. The building showed remarkable stiffness under erection loads.

Welding rods $\frac{5}{32}$ and $\frac{3}{16}$ in. in diameter were used to make $\frac{3}{8}$-in. and $\frac{1}{2}$-in. beads. Five welding machines rated at 200 amp. were used. Inspection of the welds revealed unusually uniform beads, all longer than specified.

FIG. 4—WELDING MACHINES USED ON DALLAS BUILDING

Protected by shields and heavy clothing, the welders suffered from the summer heat. Original plans contemplated the men working from positions on the beams, but the heat of the sun made the steelwork so hot this was impossible, so wooden platforms swung by ropes were used as working scaffolds. Some relief from the

FIG. 5—TYPICAL WELDED DETAILS, DALLAS BUILDING

sun's rays was obtained by laying loose planks overhead where possible.

Personnel—The building is owned by the Dallas Power & Light Co. and will be used for its general offices. Lang & Witchell of Dallas are the architects. R. L. Rolfe, of Gardner & Howe, Memphis and Dallas, designed the steelwork. The Mosher Steel & Machinery Co., Dallas, is contractor on the steel, with J. P. Churchill, works manager, supervising the work. Frank P. McKibben, associated with Carson & Carson, Philadelphia, is consulting engineer on the welding.

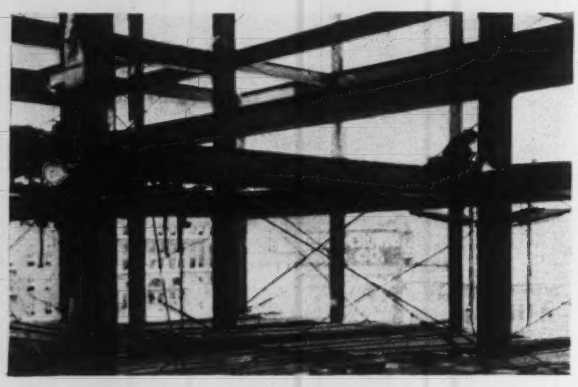


FIG. 6—WELDING CREW AT WORK, DALLAS
Note cable and turnbuckle system for plumbing and squaring steel framework.

* * *

II—Inspecting Field-Welding of Structural Steel

By William F. Carson
Of Carson & Carson, Consulting Engineers, Philadelphia, Pa.

ONE OF THE important welded structures completed during 1929 was the extension to the Montgomery County courthouse at Norristown, Pa. As shown in Fig. 1, the addition consists of the main building and a connecting wing. The main building is approximately 58x201 ft. in plan, and the connecting wing 29x56 ft. in plan. There is a total of 62 columns in the structure. The height from the ground to pent-house roof is approximately 94 ft. The total structural weight was 807 tons. The building was shop-riveted and field-welded, with most of its details similar to those of a riveted job. The principal variation from standard practice occurred at the column connections and splices. Beam to girder connections were bolted.

The writer's firm was retained to inspect the field-welding, the general design and execution of which was handled by Mellon, Taylor, Hendrickson, Inc., of Philadelphia. Frank P. McKibben, consulting engineer, General Electric Co., was consultant on the work.

Inspection—Before the welders were allowed to do any actual work, they were required to weld several sample lap-joints, each made of 8x6x½-in. plates clamped one on the other with the 8-in. edges lined up, but with the 6-in. edges offset ½ in. A full ½-in. fillet was run along the 6-in. edge. Upon completion of the welds the specimens were torn apart and broken by wedging, and the fractured metal examined. Passable weld metal had to be reasonably bright, dense, even textured, crystalline or fibrous. In addition, there had to be good fusion of weld and base metals and good penetration into the right angle corner of the fillet. A $\frac{3}{16}$-in. flux coated wire was used.

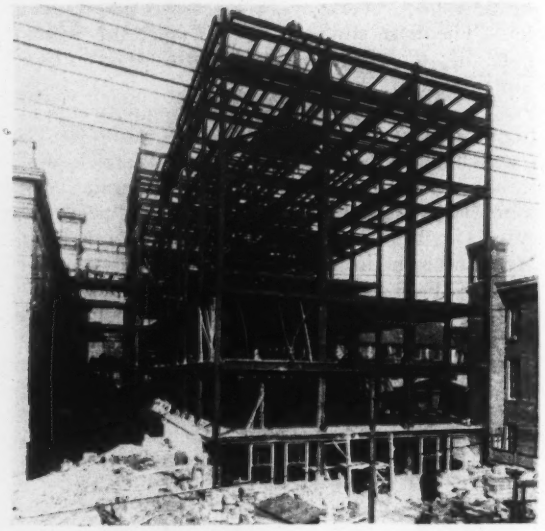


FIG. 1—FIELD-WELDED EXTENSION TO MONTGOMERY COUNTY COURTHOUSE, NORRISTOWN, PA.

In addition to the above test each welder during the progress of the work was required to make three test specimens consisting of two 4x1-in. plates 12 in. long, spliced together with 3x¾-in. plates 6½ in. long top and bottom; each spliced plate being connected to the main plates by four ⅜-in. fillets 2½ in. long. The three welders sent to the job as a result of the first test on lap joints, as described above, passed this additional field test without difficulty.

Daily reports submitted to the inspecting engineers gave the following data: floor, column or beam worked on, number of inches of welding on each face of column or end of beam and the name of the welder. In this way an accurate account was kept of the amount of welding done by each man and also of the total number of inches of welding. The records of the job show that a total of 21,668 lin.in. of ⅜-in. fillet welds was placed; that 27 in.

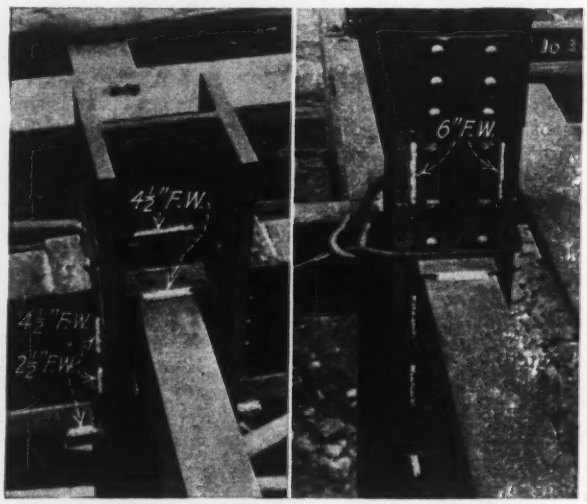


FIG. 2—TYPES OF WELDED-FIELD CONNECTIONS, MONTGOMERY COUNTY COURTHOUSE

of ⅜-in. fillet weld was required per ton of steel; that the number of welding days was 32 including six half-days; that approximately 47 in. of ⅜-in. fillet weld was placed per hour per welder. The welding force consisting of two welders and a foreman was able to push the steel erectors at all times.

* * *

III—A Rational Method of Welded Connection Design

Consideration of Effect of Moment of Applied Load as Well as of Shear Reflects Better Design Than Using Shear Alone

By Andrew Vogel
General Electric Co., Schenectady, N. Y.

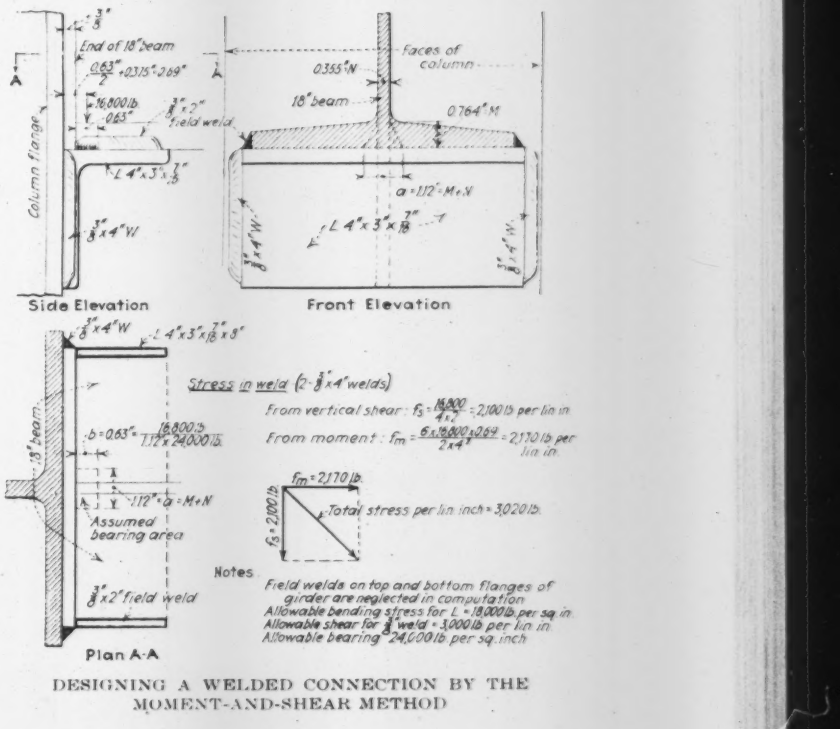
As the use of welded connections becomes more common, it is natural and necessary that design methods become more refined. The method most commonly used, that of dividing the end reaction by the unit stress, is safe enough because of the use of conservative working stresses. It is, nevertheless, approximate, and for that reason the more exact method proposed by Mr. Vogel should receive careful consideration from all designers. It is not an untried method, for it was used in proportioning all of the connections in the recently completed service building for the New York Power & Light Corp., at Albany, N. Y. This structure is partly single story and partly multi-story. It is 375x198 ft. in plan and involves 700 tons of steel in columns, girders and roof trusses. —Editor.

Engineers have become so accustomed to standard riveted connections of beams to girders or columns that the method of determining the number of rivets required is rarely considered. Welding connections, on the other hand, are new and should be subjected to careful analysis in order to be certain that the stress in any part of the weld does not exceed that desired.

Two methods of weld connection design are in use: the first is known as the shear method and the second as the shear-and-moment method. The shear method involves only determining the end reaction of the beam and then dividing this reaction by the unit stress per linear inch of weld in order to obtain the number of inches of weld metal required. As an example, assuming a reaction of 16,800 lb. and a unit stress value of 3,000 lb. per linear inch for a ⅜-in. fillet weld, 5.36 linear inches of weld will be required (16,800 ÷ 24,000 = 5.36). Assuming that an angle bracket will be used having both ends available for welding, there will be provided one-half of 5.36 or 2.68 linear inches of weld on each edge. This indicates the selection of a 3x3x$\frac{7}{16}$-in. angle as the seat angle, with 3 in. of weld in vertical lines on each end. The shear method is short, and while to date it has proved satisfactory, this is more the result of the low unit stress values used than it is of the efficiency of the method itself.

The second method requires more study, but the results are more conservative and represent better engineering. Considering again the above assumption of a reaction of 16,800 lb. and ⅜-in. fillet welds at 3,000 lb. per linear inch: The metal itself can be designed for a bearing pressure of 24,000 lb. per square inch, so that 0.7-sq.in. bearing is required (16,800 ÷ 24,000 = 0.7). The beam flanges, however, will deflect upward if this pressure is distributed over the entire width of flange, and the angle clip would deflect downward if the pressure is distributed over its width or concentrated at its outer edge. Analysis of the beam shows that a pressure of 24,000 lb. per square inch may be distributed over a width equal to the thickness of web plus the depth of flange where flange joins web, without overstressing the lower fibers of the beam. A study of the angle indicates that, because of the relative rigidity of beam and angle leg, the leg will deflect; thus placing the actual center of the reaction near the fillet of the angle. Construction considerations also require that beams shall be cut short so that they can be readily placed and also that lengths may be received plus or minus ⅜ in. or mill tolerance. It will be assumed that a gap of ⅜ in. exists between the end of the beam and the surface of the column to which it is to be connected.

The calculation of the beam-bearing area proceeds from the dimensions of the beam. Assume the beam in question to have a web thickness of 0.355 in. and a flange thickness at the surface of the web of 0.764 in. The sum of 0.355 in. and 0.764 in. is 1.12 in., one dimension of the bearing area. Since the bearing area required is 0.7 sq.in., the other bearing-area dimension is 0.7 ÷ 1.12, or 0.63 in. The bearing area, therefore, is


Side Elevation
Front Elevation
Plan A-A
Stress in weld (2-⅜"x4" welds)
From vertical shear: fs = 16,800 / 4x7 = 2,100 lb per lin in.
From moment: fm = 6x16,800x0.69 / 2x4² = 2,170 lb per lin in.
Total stress per lin inch = 3,020 lb.
Assumed bearing area
Notes
Field welds on top and bottom flanges of girder are neglected in computation
Allowable bending stress for L = 18,000 lb. per sq. in.
Allowable shear for ⅜" weld = 3,000 lb. per lin. in.
Allowable bearing = 24,000 lb. per sq. inch

DESIGNING A WELDED CONNECTION BY THE MOMENT-AND-SHEAR METHOD

0.63 in. parallel to the beam axis and 1.12 in. perpendicular to the beam axis, as shown in the accompanying illustration. Adding 0.63 in./2 to 0.375 in. equals 0.69 in., the moment arm. As the reaction is 16,800 lb. the moment at the surface of the column is 16,800 lb. × 0.69 in., or 11,600 in.-lb. The shear at the surface of the column is 16,800 lb.

From the first example, using the shear method, it appeared that a 3-in. vertical leg angle was required for shear only. Therefore, it is best to start the calculation by the shear and moment method by assuming an angle with a vertical leg of 4 in. The calculation for the stress

in the weld at the extreme ends of welds is as follows:

From shear, $f = \frac{16{,}800}{4 \times 2 \text{ welds}} = 2{,}100$ lb. per linear inch

From moment, $f = \frac{6 \times 16{,}800 \times 0.69}{2 \text{ welds} \times (4)^2} = 2{,}175$ lb. per linear inch

Stress due to shear is vertical, while stress due to moment is horizontal. Combining $2{,}100^2$ plus $2{,}175^2$ equals $3{,}020^2$, or the maximum effect due to combined shear and moment is 3,020 lb. per linear inch of $\frac{3}{8}$-in. fillet weld. It appears, therefore, that the connection is conservatively designed and that a $4 \times 3 \times \frac{7}{16}$-in. angle is required with 4 lin.in. of $\frac{3}{8}$-in. fillet weld applied in vertical lines on both ends of the angle. When the beam has been erected it is well to apply 2 in. of $\frac{3}{8}$-in. fillet weld to connect the edges of the beam to the angle. The second method described, which is illustrated in some detail in the accompanying drawing, is the better method of the two discussed, as the results are more conservative, and better knowledge of forces acting and stresses involved is provided. The second method also offers the possibility of extension to cover various types of connections involving horizontal and vertical lines of welding. It also accounts for the higher test values shown by angle clips welded to columns by horizontal lines of welding instead of vertical lines. The second method deserves particular consideration in view of its wide range of application and the simplicity of the calculations.

* * *

IV—Large Area of Welded Steel Floor in Pittsfield, Mass., Garage

By Ernest N. Adams

District Engineer, American Institute of Steel Construction, Inc.

THE FIRST unit in the expansion program of the Berkshire Auto Co. of Pittsfield, Mass., is a two-story addition having a second floor area of approximately 8,500 sq.ft. of steel "battledeck" floor construction. The building is of structural steel frame with brick walls and a 2-in. wood plank roof.

The second floor of the addition, which is reached by a ramp from the present building, consists of $24 \times \frac{1}{4}$-in. steel plates welded to 5-in., 10-lb. I-beams, 2 ft. on centers. The average span of the construction is 20 ft. and it weighs 15.2 lb. per square foot. Designed as a continuous beam, the safe maximum uniform distributed load for the floor is 135 lb. per square foot, with a total deflection of 0.261 in. The building code of Pittsfield calls for a designed superimposed live load of 100 lb. per square foot for garages, which in this case would give a theoretical deflection of 0.194 in.

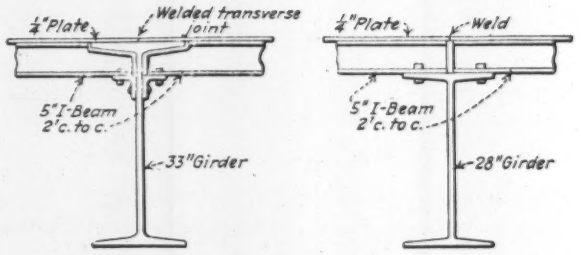


FIG. 2—TYPICAL DETAILS OF WELDED STEEL FLOOR IN PITTSFIELD, MASS., GARAGE

The 5-in. I-beams frame flush with the top of the girders, most of which are 33 in. deep. The bottom flanges of the beams are bolt-connected to the girders through $3 \times 3 \times \frac{3}{8}$-in. angles, and the webs are welded. The girder across one end of the building is only 28 in. deep, and here the 5-in. I-beams rest on the top flange which brings them flush with the rest of the construction. Details of these typical connections are shown in Fig. 2.

The $\frac{1}{4}$-in plates were stretched and resquared and were delivered to the job in bundles strapped to wood timbers to keep them from being distorted in transit. Calculated spacing between the plates was $\frac{1}{4}$ in., and because the plates were so straight and true, there were very few cases where this spacing had to be varied.

To hold the plates in contact and directly over the center line of the 5-in. I-beams, tack welds of from $\frac{3}{4}$ to 1 in. in length were placed every 2 ft., starting in the center and working toward the girders. However, as soon as the automatic welding machine was started, many of the welds broke because of the local heat generated in the plate. The spacing of the tack welds was, therefore, reduced to 18 in., which proved satisfactory.

This automatic welding machine, welding plate to plate to beam in one operation, traveled at a speed which varied from 6 in. to 12 in. per minute. Some difficulty was encountered in obtaining a satisfactory weld where the space between the plate was less than $\frac{1}{4}$ in., but none where it was greater. From experience gained on this project, an absolute minimum spacing between the plates of $\frac{1}{4}$ in. is recommended.

At the present time no wearing surface is contemplated on the steel-plate floor. Should oil from the automobiles cause the floor to become too slippery, a very thin wearing surface of asphalt will be used. As the garage will

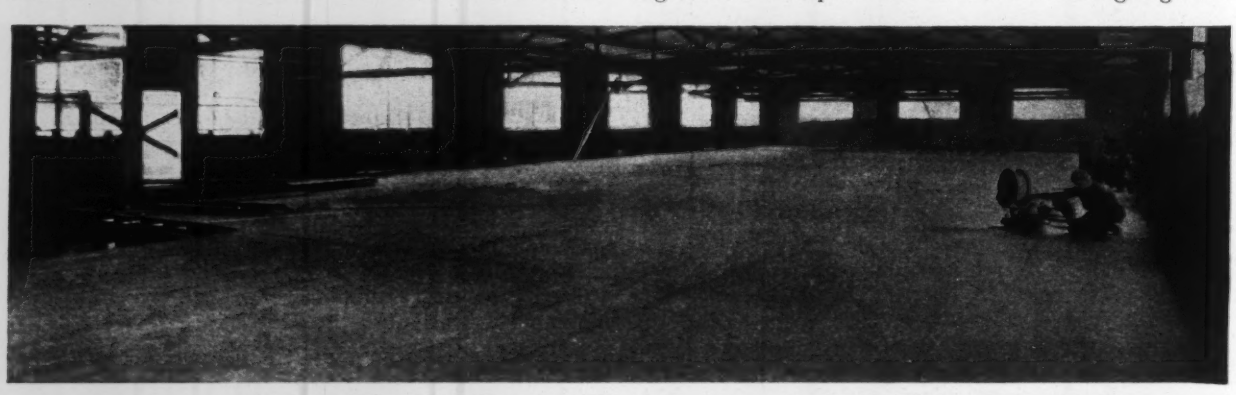


FIG. 1—WELDING STEEL FLOOR PLATES WITH AUTOMATIC MACHINE

have an automatic sprinkler system, no protection is required beneath the floor construction.

George E. Haynes, of Pittsfield, is the architect and engineer on the project, and the structural steel was fabricated, erected and welded by the Haarman Steel Co., of Holyoke, Mass.

* * *

V—Welding Field Joints on a Fourteen-Story Office Building

New Headquarters of Edison Company of Boston Utilizes 1,300 Tons of Steel—Accurate Welding Records Kept

By J. Theodore Whitney

President, Whitten-Beckman Engineering Co., Boston, Mass.

THE STRUCTURAL steelwork of the new office building for the Edison Electric Illuminating Company of Boston, has all field connections electric-arc welded. As such it represents the first project of its kind in Boston and was made possible by the building commissioner exercising his discretionary powers under the building law, which allows the use of new materials or methods under such regulations as the commissioner may fix. In this case the requirement fixed was that the consulting engineer, F. P. McKibben, should certify by affidavit that the building, as pertains to the welding, would conform to the stresses and strains required by law, and that at the completion of the welding should certify by a final affidavit that the building does conform.

Some of the results observed, because of the use of welding instead of riveting on this structure, are as follows: (1) Noise of construction of joints in the steel frame were practically eliminated at site of erection; (2) accident hazard was greatly reduced by elimination of dropped bolts and rivets; (3) alterations, made necessary by errors or changes, were more easily made; (4) smaller gussets were required for wind bracing; (5) staging for erectors was more simple and less expensive; (6) fire hazard was reduced due to absence of hot rivets; and (7) connections to support erection derricks were easily and rapidly made as work advanced.

Lease Conditions Affecting Design—The building is fourteen stories high, covering a plot approximately 110x58 ft. It contains 1,314 tons of steel, of which 1,050 tons is framed together by welding. Conditions in the leases on the two lots making up the plot required the building to be designed for "any commercial use allowed by the zoning law." This necessitated the use of a 125-lb. live load on all floors, although only offices are contemplated above the second floor. Further stipulation that the portion of the building on each lot be designed as a unit made provision necessary in the design for the possibility of a future party wall, stairs, elevators, ash hoists, boiler rooms, chimneys and vents. The floor steel was arranged to suit these conditions should they arise, and connections for future work were provided.

Design—Inasmuch as the height of the building is over three times its width, wind pressure had to be considered. Special attention was given to details of connections of girders to columns. The load reactions were taken by web angles on the girders, welded to the columns in the field at the toes of the angles. The wind loads were transmitted to the columns by means of split girder beams on the bottom flanges and plates on the top flanges. For those girders with small moment in the connections, a piece cut from a girder beam with the web riveted to the bottom flange made vertical field-welding possible to the column on the cut ends of the flange, as shown in Fig. 3a.

For the large moment connections (Fig. 3b), split girder beams were used as gussets with the flange riveted to the bottom flange of the main girder. The field-weld was applied where the web contacts the column. Stiffeners along the gusset edge were channels or angles. In the case of some shallow girders, it was necessary to

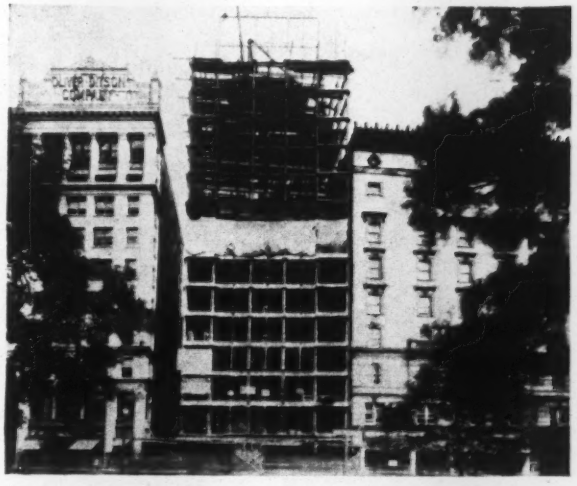


FIG. 1—SHOP-RIVETED, FIELD-WELDED FRAME OF NEW EDISON CO. BUILDING IN BOSTON

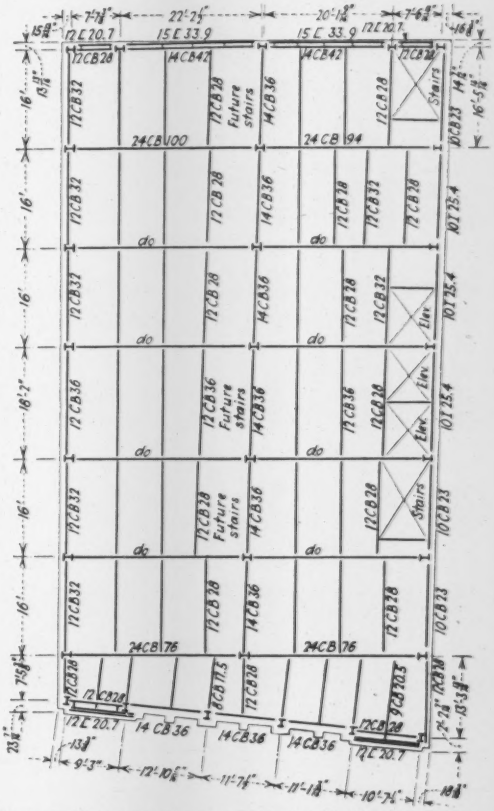


FIG. 2—TYPICAL FLOOR FRAMING, EDISON BUILDING, BOSTON

TABLE I—WELDING DATA, EDISON CO. BUILDING, BOSTON

Welding wire used	1,500 lb. of 5/32 in. 1,100 lb. of 3/16 in.
Total	2,600 lb.
Welding wire melted	80 per cent of 2,600 lb., 2,080 lb.*
Electric current consumed	6,120 kw.-hr.
Electrode melted by 1 kw.-hr	0.34 lb.
Fillet weld (⅜-in., ½-in. and ⅝-in.)	60,514 in.
Weld per kw.-hr	9.9 in.
Weld per lb. of electrode wire bought	23.3 in.
Weld per lb. of electrode melted	29.1 in.
Structural steel	1,314 tons
Structural steel welded	1,050 tons
Weld per ton of steel welded	57.6 in.
Man-hours welding	1,205½
Weld per man per hour	5.02 in.
Welding per man-day of eight hours	Average 33 ft., 6 in.

*Stub ends of electrode wire represent a loss of approximately 20 per cent of wire purchased.

slot the top plate (Fig. 3c) to permit a sufficient amount of fillet weld.

Inasmuch as few fabricating shops are equipped for shop-welding to any great extent and to give all shops a chance to compete, the structural design was made to follow standard practice so far as the shop was concerned, using standard connections (increased to ½ in. thickness to secure a proper ⅜-in. fillet weld) and using customary clearances.

For seat and stiffener connections on columns, regular shop practice was used, except that the seat angle was made wider than the flange of the beam, to allow for field-welding along the bottom flange. Holes for erection bolts were provided to make possible the plumbing, leveling and alignment, without the use of wood shores and braces. Details were so worked out as to eliminate overhead welding.

Erection and Field-Welding—Erection of structural steel was begun on April 9, 1930, with the setting of the cantilever foundation beams and grillages. Welding was begun on April 28, 1930, and completed June 27, 1930. Four welding machines were utilized. The welding crew consisted of a foreman, four welders and an engineer to care for the welding machine, the latter being necessary in order to comply with union requirements. Each welder used the same machine throughout, making it possible to keep accurate records. The field-welding totaled 60,514 in.; 17,780, 16,644, 16,515, 9,575 in. of field-weld made by the welders respectively. Most of the welds were ⅜-in. fillet, although some were ½ or ⅝ in. in size.

The machines were set up in the rear portion of the first floor and remained unmoved until the welding was completed. The battery of machines is shown in Fig. 5. A voltage of 20 and an amperage of 175 were used, except that the amperage was increased to 185 when the upper part of the structure was being welded. The cost of staging was materially reduced by using Z-shaped steel bars of approximately 2x½-in. section, which hooked over the tops of the girders and supported a plank on which the welder worked.

Inspection—Local inspection of each weld and qualification tests to determine the competency of welders were important features of the work. At least twice a week each welder was required to run a lap-weld sample which was broken so that the fracture could be examined.

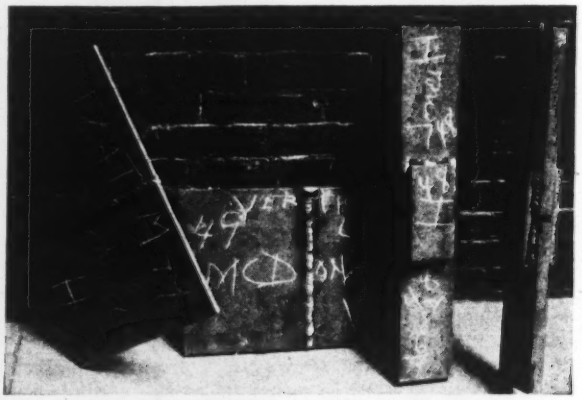


FIG. 4—WELDED PLATES FOR QUALIFYING WELDERS
The two butt-welded specimens at the left are to be cut into strips 2 in. wide for tension tests. The two fillet-welded specimens at the right are tested in tension to determine the longitudinal shearing strength of the weld.

Daily reports were made by the job inspector, giving in detail number of inches of weld for each connection, by whom made and the size of the fillet. Visual inspection only was used.

Qualification of Welders—Before they were allowed to work on the structure all welders were obliged to weld specimen plates for testing. Requirements for each man were as follows: (1) Two lap-welds, one made horizontally and one vertically, to be made and broken when cool to determine amount of penetration, uniformity of

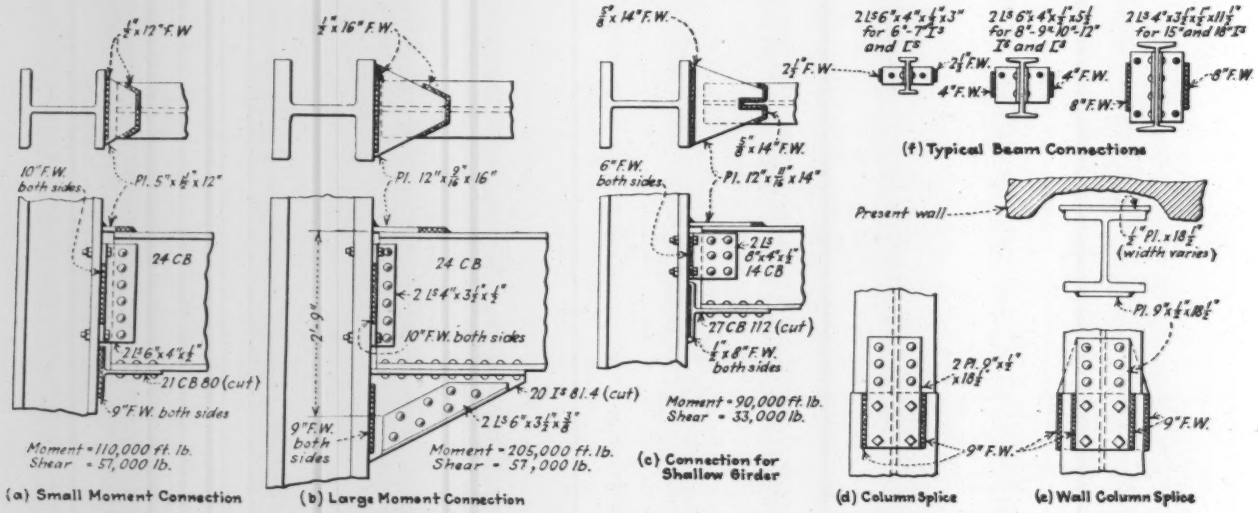


FIG. 3—TYPICAL WELDED FIELD CONNECTIONS, EDISON BUILDING, BOSTON

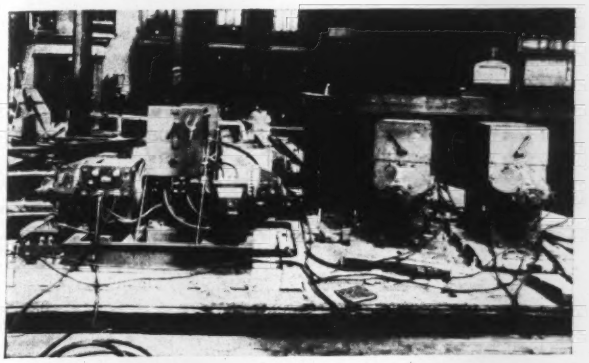


FIG. 5—WELDING-GENERATOR PLANT, BOSTON BUILDING
Four individual-operator machines remained on this platform at rear of first floor throughout all erection work.

weld fracture, etc.; (2) two butt-welds to be made, one run horizontally and one vertically, using two 9x½x12-in. plates for each specimen, these welds to be machined to the thickness of the plates, the specimens cut into strips 2 in. wide and tested (the highest test specimen of the seven welders who qualified—although only four welders were used on the work—showed 56,500 lb. per square inch ultimate strength, the poorest showed 43,700 lb. and many specimens broke outside the weld); (3) two ⅜-in. fillet-welds 10 in. long, one horizontally and one vertically to be made by welding a 3x¾x6½-in. plate on each side of plates 12x1 in. by 2 ft. 4 in. long, ends separated ½ in. and tested. (The best specimen broke at 155,200 lb. and the poorest at 105,600 lb., giving a value of 15,520 lb. down to 10,560 lb. per linear inch, which represents a factor of safety between 5 and 3½, since the design value used was 3,000 lb. per linear inch). Fig. 4 shows a group of test specimens.

The building was designed by Bigelow, Wadsworth, Hubbard & Smith, architects, Boston. The Whidden-Beekman Engineering Co., Boston, was the designing and supervising engineer for the structural steelwork, floor system and foundations. Frank P. McKibben was consulting engineer on welding and was assisted by William F. Carson, of Carson & Carson, engineers, Philadelphia. The construction work was done by the W. A. & H. A. Root Co., Boston. The American Bridge Co. made the shop details and fabricated the structural steel, F. L. Castleman and H. B. Castleman, of that company, giving their personal attention to the welding details. The Daniel Marr & Son Co., of Boston, erected the structural steel, which was field-welded by the Leake & Nelson Co., of Bridgeport, Conn.

* * *

VI—Arc-Welding Facts That Should Be Common Knowledge

AS THE number of electric arc-welded steel buildings increases and as the size and height of these structures become greater, municipal building commissioners and chief building inspectors will find, at the beginning of each inspector's career, a need for the latter's instruction in the elementary and fundamental features of arc-welding as applied to ordinary steel building construction. As an aid in this process, Frank P. McKibben, consulting engineer of the General Electric Co., has prepared a series of questions and answers relating to arc-welding

The following list of facts has been abstracted from Professor McKibben's answers. These facts should represent common knowledge in the structural field. It should be generally known that:

1. The electrode or welding wire, of practically the same grade of steel as the steel parts to be welded, is generally about 12 to 18 in. long and from ⅛ to ¼ in. in diameter and forms one terminal of the electric circuit.

2. Base metals should be clean and free from rust, dirt, grease, paint or other foreign substances, except that a thin coating of linseed oil may be permitted.

3. The arc is made (after the positive terminal has been connected to the steel parts to be welded) by touching the end of the welding wire (the negative terminal) to the steel parts and then withdrawing the wire about ⅛ or ¼ in.

4. Direct current is almost exclusively used for arc-welding structural steel.

5. Electrode diameters at present are $\frac{5}{32}$ or $\frac{3}{16}$ in.

6. A short arc is preferable to a long arc, since it makes a purer weld, gives better fusion and penetration and causes less spattering of the molten metal.

7. The voltmeter reading varies, recording a small amount when the operator is welding; a larger amount when the machine is running idle.

8. The ammeter needle also varies, recording a large amount when the operator is welding and standing at zero when the machine is running idle.

9. Provision is made on welding machines to vary the amperage so that either more or less heat is available to the welding operator.

10. The thicker the steel parts to be welded the greater is the amount of heat required and the greater the amperage.

11. Each welder's work should be identified by requiring him to use a die or stencil for marking the steel at each weld that he makes.

12. In welding steel building frames, triangular fillet-welds are nearly always used and are generally of ⅜ in. size, although they may be specified as small as ¼ and as large as ¾ in.

13. Good welds may be insured by (*a*) employing only welders who have passed qualification tests; (*b*) requiring each welder, during progress of the work, to pass additional tests; (*c*) requiring the welding wire to conform to proper specifications; (*d*) inspecting the welds while they are being made to see that the operator is holding a short, steady arc and using the proper amount of current; (*e*) examining the finished welds and accepting only those having a smooth appearance, free from gas holes or porous places, with the crater showing good penetration into the base metals and with sharp edges of deposited metal.

14. For depositing a ⅜-in. triangular fillet a current of from 175 to 200 amp. should be indicated on the ammeter. For a ¼-in. fillet, a current of 150 to 160 amp. should be indicated.

15. Depending somewhat on the thickness of the steel to be welded, $\frac{5}{32}$-in. diameter electrodes require 150-200 amp. and $\frac{3}{16}$-in. diameter electrodes 175-225 amp.

16. A condemned weld should be cut out either with a compressed air tool or by hand to permit rewelding the joint.

17. The first tier of steel in a welded building should be plumbed true to lines and levels, and all connections should be securely bolted or clamped before starting arc welding. Every tier thereafter should be treated in the same manner.

Garbage and Refuse Collection and Disposal at Pontiac, Mich.

Municipal Service and Incinerator Displace Contract System and Hog Farm—Costs for Collection and Disposal

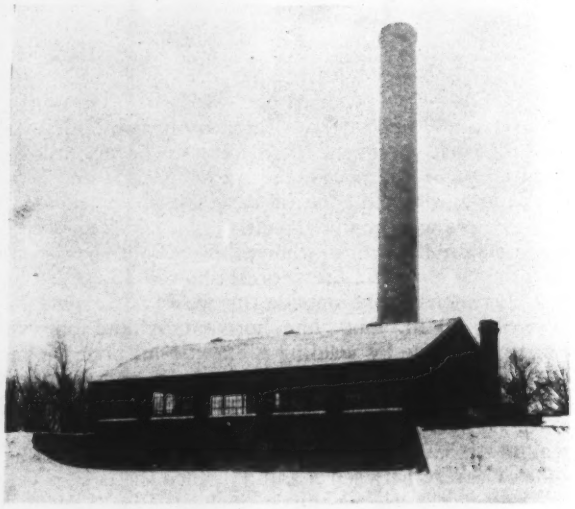
By James R. Pollock
City Engineer, Pontiac, Mich.

RAPID GROWTH of the city and complaints as to both collection and disposal of its garbage and rubbish led the city of Pontiac, Mich., to change from private to municipal service and to substitute incineration for the hog feeding practiced by the contractor. Some details of the change and unit and total cost figures for the municipal service are given in this article.

Pontiac, the home of automobile, coach, motor truck and machinery manufacturing plants, is a city of 70,000 people, situated 25 miles northwest of Detroit and at the northern end of Woodward Ave., leading from the latter city. The area of Pontiac is slightly over twenty square miles, with topography somewhat rolling and a variation of about 125 ft. between the lower and higher portions. Street grades are such that 6 per cent as a maximum can usually be obtained without excessive cuts. Pontiac is quite largely a city of detached houses. There are a number of two-family houses and within the last three years about twenty apartment houses have been built, nearly all equipped with an incinerator.

Contract System—Up to November, 1928, the collection of garbage in Pontiac had been done entirely by contract, the prices having been, successively, $22,500, $23,000, $25,000 and $33,600, or an average of $25,025 a year. The contractor hauled the garbage into the country about seven miles and fed it to hogs. A rubbish cleanup in both spring and fall was arranged in co-operation with a "cleanup and paint-up" campaign. This has been continued. Shortly before collections of rubbish are made the daily newspaper informs the residents when the trucks will be along and calls for the property owners to have their rubbish placed at the curb in containers which will not fall apart when handled. The city does not collect ashes. This is done by small private collectors, usually for 25c. a week. If ashes are piled in the back yard and removed in the spring, a winter's accumulation may be removed for $1 to $3.

The contract method of garbage collection resulted in many complaints about the poor and irregular service. Numerous complaints were also received from the community in which the hog farm was located. After thorough study of the whole problem of waste collection and disposal, the main conclusions were that the public wanted, and was entitled to, a better collection service, and that city operation would be necessary. Since Pontiac is in a rapidly growing metropolitan area extending for miles in every direction, it was decided that disposal of garbage by hog feeding would not be tolerated by any community in which the city tried to establish it. The price of land is so high that the city would not be justified in purchasing sufficient acreage for a hog farm. It was decided that the city would collect and dispose of garbage and rubbish. A $70,000 bond issue was voted for an incinerator, plans and specifications drawn, and six incinerator companies submitted a total of seventeen bids, including various alternates. The contract was awarded to the Superior Incinerator Co., Dallas, Tex., at $79,892, which included $9,500 for a preheater. The $9,892 above the bond issue was included in the annual budget.



VIEW OF PONTIAC INCINERATOR

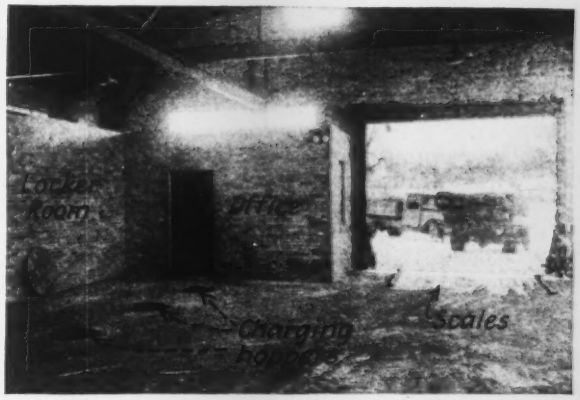
Municipal System—On Nov. 3, 1928, the city commenced operating its own system of waste collection and disposal. Before that an ordinance was passed requiring householders to drain garbage and wrap it in paper before putting it out for collection. To offset this slight inconvenience to the housewife, the placing of food cans with the garbage was permitted. Rubbish too bulky to be put with the garbage must either be put in separate receptacles or else bundled and tied. Garbage cans must be of 10- to 20-gal. capacity, of metal, watertight, and equipped with tight-fitting cover. Cards were printed and delivered to every house, giving the simple rules and regulations imposed for the house treatment of garbage and rubbish.

Householders are required to place garbage and rubbish in their back yards, not more than 25 ft. from the rear of the house. Collections from residential districts are made weekly from November to April and twice a week from May to November. From restaurants, hotels and food-handling establishments collections are made daily, except Sunday. Rubbish collected from residences and commercial houses is very small in amount and is taken to the incinerator in the same wagons as is the garbage. Some business houses deliver their rubbish to the incinerator. This, together with boxes and other combustible wastes collected by the city from industries, is sufficient to burn the garbage without purchased fuel.

To make collection of the mixed refuse, ten 1½-ton trucks were bought for a total of $20,600 from the annual budget. Each truck has a 4-yd. steel body equipped with a hydraulic hoist to raise the body to an angle of 50 deg. with the horizontal, thereby insuring complete dumping of the loads. The trucks are equipped with dual wheels in the rear and single wheels in front. The top of the truck body is 63 in. from the ground, so that it is easy for the average-sized man to empty material into the body. When the truck is full a tarpaulin is pulled over the load and tied securely, thus removing objections from the public in transporting it to the incinerator. These covers are very effective and permit the heaping of the loads. Each truck is operated by two men who alternate in driving the truck from house to house. Each truck crew is responsible for the appearance of its truck, which is washed each night with hot water.

During the summer collection period the city is divided into five residential collection districts and for the winter this is reduced to three districts. The collection of rubbish from the manufacturing plants has been done mostly by one truck, but during the peak periods by two trucks. In summer we had a maximum of eight trucks in service with two in reserve. Ordinary repairs are handled at our municipal yards, where we do any regular repair work in trucks and tractors.

Taking Care of Complaints—The handling of complaints has received special attention. Complaints are usually made direct to the incinerator plant, but sometimes to the city hall. When the collection service was first inaugurated a special complaint truck was operated, but as the number of complaints was not sufficient to justify the expense of maintaining it the method was changed so that each collection crew was made responsible for taking care of the complaints in its district. Complaints received in the forenoon are taken care of in the afternoon and those received in the afternoon are taken care of the next morning. This method puts on the collectors the responsibilitiy of taking care of their own mistakes; if there seem to be too many mistakes a change in personnel is made. About half of the complaints for non-collection are unjustifiable. Some of the more usual causes for complaint are collectors barred by cross dogs, delays caused by bad weather and insufficient can capacity.

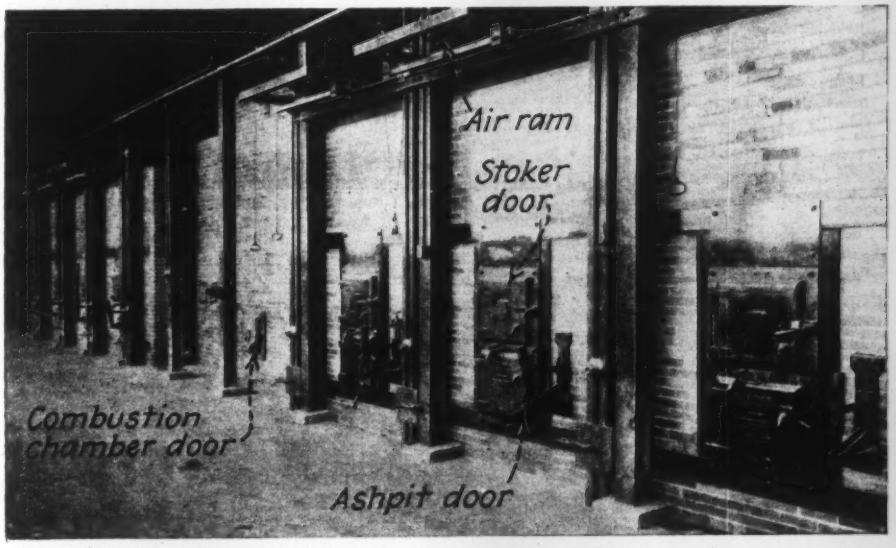


CHARGING FLOOR OF INCINERATOR

Incinerator Plant—The incinerator has a rated capacity of 150 tons per 24 hours. The loaded trucks discharge directly over or adjacent to the charging hoppers, entering and leaving the building over concrete ramps.

There are two furnaces, one a three-cell and the other a four-cell unit. Each furnace has a rated capacity of one ton per cell per hour when burning mixed refuse consisting of 35 per cent combustible material and 65 per cent garbage, having a moisture content not to exceed 75 per cent. There is a ¾-yd. container directly over each cell into which the trucks can dump directly if desired. Operators on the charging floor keep the containers filled and the stokers feed the refuse to the furnaces as they are able to consume it. A horizontal slide operated by an air ram opens and closes the charging container as desired. A storage bin can be built when the growth of the city necessitates it.

On the first or operating floor are located the furnaces, the heating and hot water units and the air-compressor units. The furnaces are of brick, with firebrick-lined interior and salt-glazed brick exterior. They are heavily buck-stayed. Stoking of the furnaces may be done from either side. The grates are of cast-iron, of the cantilever dumping type, operated by a shaker from the front. Cleaning of the fires is accomplished in a few minutes with little effort on the part of the stoker. Ashes are shoveled from the ashpit into wheelbarrows and dumped into a truck parked at the rear door of the plant. Tin cans are pulled out through the stoking doors.



STOKING FLOOR OF INCINERATOR

The gases of combustion pass into a combustion chamber between the two furnaces, which is of such size to allow the gases to expand and reduce their velocity, while baffle walls assist in destruction of odors and collection of dust particles. This chamber is provided with necessary clean-out doors. At the rear of the combustion chamber and adjacent to the stack there is a preheater for the forced draft supply, thereby delivering to the furnaces air at 300 to 500 deg. F., which is a material

aid in burning wet heavy refuse. The preheater is built of vertical cast-iron tubes through which the hot gases pass while the air from the motor-driven fan passes over the tubes. Behind the preheater is a direct pass to the breeching, provided with a guillotine-type damper adjustable to any degree of opening. The chimney is of red radial brick construction, 140 ft. high, with an internal diameter at the top of 8 ft. A self-supporting firebrick lining, laid in high-temperature cement, extends to the full height of the chimney.

The building is of fireproof construction with ample ventilation and light. Its interior is finished in buff salt-glazed brick which is easily cleaned. There is a locker room, shower and toilet for the workmen and an office for the superintendent and scale man.

Cost Data—Complete cost records are kept. For the first year of operation, ended Nov. 2, 1929, 7,761 tons of mixed refuse were burned, of which 6,069 tons was garbage and 1,792 tons, or 23 per cent, was rubbish brought in separately from commercial houses and industrial plants. The per capita amount of garbage collected, on a basis of 65,000 contributing population, was 184 lb., which might be increased to 200 lb. if an assumed average of 16 lb. was burned on the premises during the winter. Dead animals consumed at the plant were 832 dogs, 183 cats, one horse and one goat. The collection trucks traveled a total of 51,769 miles. The haul from the incinerator to the center of area of the five summer collection districts is 2.72, 2.49, 3.22, 0.31 and 2.23 miles respectively; for the three winter collection districts, the haul is 2.47, 2.56 and 1.55 miles respectively.

The average operating cost per ton for collection for the first year was $3.93, made up as follows: superintendence, 16.3c.; labor, $2.81; truck maintenance, 71c.; general maintenance, 3.5c.; insurance, 16.7c.; injuries and damages, 2.2c.; sundries, 2c. For the same period the average operating cost per ton for disposal was $1.81, divided thus: superintendence, 17c.; labor, $1; fuel, 16c.; power and light, 4c.; general maintenance, 21c.; maintenance of grounds, 6c. Collection and disposal together cost $5.74 a ton, with no allowance for capital charges.

The books of the city show no capital charges against the garbage and refuse service. The original capital outlay for this service totaled $100,392 with no allowance for the incinerator site, which the city had owned for a number of years and which cost the city little if anything. The city sold $17,000 of incinerator bonds in 1928, bearing 4½ per cent interest and payable within fifteen years, in fourteen installments of $5,000 each. The annual budget took care of the remaining $30,392 and succeeding budgets provided for bond interest and redemption. In view of these facts capital charges have been computed as follows: for collection equipment, a depreciation of $6,250 a year on the $20,500 paid for the ten motor trucks, or 55c. a ton on the 1928-29 collections; for incinerator, $5,000 a year for bond retirement; $1,610 as the average interest charge; $3,200 a year (4 per cent) for depreciation; total, $9,810, or $1.27 a ton.

The average annual cost per ton for garbage and refuse collection and disposal in Pontiac for the year ended Nov. 2, 1929, thus becomes $7.56, of which collection represents $4.48, divided into $3.93 for operation and $0.55 for capital, while $3.08 is for disposal, divided into $1.81 for operation and $1.27 for capital. On this basis the entire yearly cost for 7,761 tons of garbage and rubbish is $58,673 for an estimated population of 65,000, or about 90c. per capita.

Design and Operation—Plans and specifications f the incinerator plant and a report on the system of c lection were prepared by Pearse, Greeley & Hanse consulting engineers, Chicago, Ill. The problem w studied and all work done under the supervision of t writer as city engineer. A. E. Hansen was reside engineer on the construction of the plant and is now charge of waste collection and disposal. The city's eng neering department is practically a department of publ works and service, and everything in this line, except t water department and the electrical department, is und the jurisdiction of the city engineer. During the sum mer we have as many as fourteen men for collection an five men at the plant, while during the winter we hav six collectors and two workmen at the plant.

As an example of the monthly summaries presented t

CITY GARBAGE TRUCK, PONTIAC, MICH.

the city engineer by A. E. Hansen, superintendent of the division of waste collection and disposal, the substance of the report for February, 1930, is given here:

During February we received 298.61 tons of refuse, which consisted of 17.8 per cent rubbish. It may be segregated as follows:

Garbage collected by the city	237.76 tons	
Rubbish collected by the city	45.69 tons	
Total collected by the city		283.45 tons
Garbage brought in by outside trucks	7.65 tons	
Rubbish brought in by outside trucks	7.51 tons	
Total collected by outside trucks		15.16 tons
Grand total		295.61 tons

	Garbage	Rubbish	Garbage	Rubbish	Total
On hand Feb. 1, 1930	1.51	1.01	.....	.....	.....
Received during February	245.41	53.20	.....	.....	.....
From stockpile	.....	2.04	.....	.....	.....
Total	246.92	56.25	246.92	56.25	303.17
On hand March 1, 1930	.....	1.39	.....	.....	.....
For hog feed	46.44	.....	.....	.....	.....
To stockpile	.....	15.92	.....	.....	.....
Total	46.44	17.31	46.44	17.31	63.75
Total refuse incinerated	.....	.....	200.48	38.94	239.42

No garbage was burned for a period of two weeks while repairs were being made on the stack, thus necessitating piling some of the garbage and rubbish outside. This became wet during rainstorms and it was necessary to use 16.82 tons of coal as additional fuel.

For heating purposes 1.99 tons of coke and 2 tons of coal were received. Eleven cats and 117 dogs were disposed of.

PLANT OPERATION, FEBRUARY, 1930

	Total	Per Ton
Total refuse incinerated, tons	239.42	.....
Per cent of rubbish	16.3	.....
Man-hours charging	109.25	0.456
Man-hours stoking	56.50	0.236
Total man-hours burning	165.75	0.692
Man-hours pulling ashes	46.0	0.192
Man-hours wheeling ashes	55.0	0.230
Total man-hours cleaning	101.0	0.422
Total man-hours cleaning and burning	266.75	1.114
Hours burning	43.45	.....
Tons per hour per cell (rate 1.00 ton)	1.16	.....
Wheelbarrows of cans and ashes	964	.....
Weight of cans and ashes, tons	33.82	.....
Per cent ash	14.1	.....
Kw.-hr. per ton	.....	0.94

Force-Account Levee Construction a Disruptive Policy

An Argument for Abandoning Government Competition With Contractors for Mississippi Flood-Control Work as Subversive to Sound Levee Project Planning and Economy of Construction

By Walter F. Lineberger
Assistant to the President, Standard Dredging Co., Washington, D. C.

NO STUDY of the Mississippi River flood-control problem nor effort to seek a solution of it would be complete without a discussion of the use of government plant and forces for construction as opposed to letting the work by contract. Basically, the effort to put, or perhaps the mere drifting of, the government into the contracting business on an unprecedented scale on the Mississippi River is at the bottom of the difficulties of practically every private contractor on the river. All contractors, at one time or another, have been the victims of unreasonable bureaucratic demands and arbitrary decisions.

The present Chief of Engineers, Major-Gen. Lytle Brown, has stated (*Engineering News-Record*, Feb. 6, 1930, p. 227):

> Every effort is made to do as much of the work by contract as is possible. No work is done by the government-hired labor forces except when it is impossible to get the work done as economically by contract. Contracts can be let at 25 per cent more than the cost if done by day labor, and they are frequently made at higher figures than the government estimates. No steps other than those being taken are possible to give more encouragement to contractors to enter this field of work and to develop machinery and methods of the greatest efficiency. The desire of all concerned is to encourage the contractors of the country to enter this field.

General Brown's expressed position is unequivocal. I believe that every contractor on the river would be satisfied if it could be demonstrated that this same spirit permeates the entire local organization of the engineering department. Is the Chief of Engineers meeting with the necessary co-operation on the Mississippi River?

The purpose of this article is to call attention to this phase of the problem, because it casts a shadow across the entire field of the relationship between the government and the contractor and is inextricably involved in all engineering discussion and design connected with the subject. No constructive solution can be arrived at until the situation is clarified. It seems, therefore, well to take stock of this condition now so that the misunderstandings, delays and other kindred disadvantages may not become cumulative to the degree of stultifying the entire government program.

I—Unfair Competition

The effect of government bidding on levee work, which was probably intended originally to keep only sufficient levee-building machinery on the river for emergency work and to hold down contractors' prices to reasonable limits, has actually been to set up the United States as an active competitor. It has done more than that. It has established a personnel, both in the offices of the Mississippi River Commission and in the field, whose jobs depend upon continuous operation of the government plant and who feel, perhaps unwittingly, that every contract awarded is a threat against their security. Their influence, inimical to the contractor by reason of this fact, is very considerable, as they are naturally the source of information for administrative officers of the Corps of Engineers on technical matters. This influence tends inevitably to produce a condition of mind that leads them automatically to make the position of the contractors as difficult as is possible under the specifications, which have been assiduously drawn by the engineers so as to leave large arbitrary discretionary power in their hands. This operates to the disadvantage of the contractors regardless of the type of equipment used.

In general, it may be said that the plans for various projects are for the same reason inevitably drawn to fit existing government plant, a condition that extends also to all basic thought given to the design and location of levees. It is only in extraordinary cases, such as the construction of the side levees for the Bonnet Carré spillway, that a design is approved which is recognized as beyond the scope of government plant.

II—Information to Contractors Deficient

It may also be said that in general the plans furnished bidders for the various levee projects are a direct handicap to the contractor in that they are sadly lacking in the information required by him to make an intelligent bid on the proposed work. Plans turned out by the Vicksburg office are the best in this respect. Those of the Memphis office are not so good, and those of the New Orleans office contain, as a rule, little more than a profile of the new levee and its location with reference to the old levee.

If a contractor is persistent he may be allowed to consult records of borings (if such borings exist) and similar data in the commission offices, but these data are not offered freely, but rather as something confidential to which the contractor has no legitimate right. Moreover, the contractor must know in advance exactly what information has been collected by the field forces and he must ask for the particular data desired, as the commission does not publish the scope of its field investigations or the results thereof.

All of the data collected in the field or compiled in the office should be shown on the plans or attached thereto, in order that the contractor may carry a complete survey into the field when he goes over the work. Very often it is necessary for a contractor, especially on large projects, to make his own borings and even surveys of details not shown on the plans. Since bids on a number of projects are usually received on the same day, with only 30 days' advance notice in which to collect information on all of them, very few contractors have an engineering staff large enough to cover more than two or three of these projects, except in the most hurried and superficial manner. For this reason many contractors

have gone broke on levee work as a result of the lack of information upon which to base an intelligent bid.

By memorandum dated April 13, 1917, the then Chief of Engineers ordered that advance information relative to proposed levee work be published to contractors. This is a most constructive policy, as it gives contractors a chance to get prices on new equipment, estimate the volume of probable new work in other fields and make careful field examination of such levee projects as fit their available equipment, and decide what levee projects they can economically undertake. It means that bids will be carefully analyzed and well balanced. However, it is believed that these instructions have been disregarded, for the reason that the several district offices do not desire to publish to contractors any advance information relative to the proposed work until all of the projects required to absorb available appropriations have been approved.

If a tentative list of projects were published to contractors, and later many or even all of the projects contained therein should be disapproved, it is my opinion that the contractors as a whole would find nothing to criticise therein, as the spirit of co-operation shown thereby and the information collected by contractors on projects (which would undoubtedly be eventually approved) would be very valuable to the contractors from an economic standpoint.

III—Estimates Deceptive

The government estimates for levee work are generally regarded by contractors as very much too low. However, if the government should be the successful bidder, they may be defended on the ground that all of the unknown factors in the specifications covered by the repetition of the phrase "as the contracting officer may direct"—against which the contractor must insure himself by an increase in his bid—can be disregarded, because when the work is done by government forces and plant the overwhelming tendency is to keep the final cost within the estimate. Regardless of violation of the specifications or time limit this is generally done.

No good reason, except that the government personnel on levee work has been established as an active competitor of levee contractors, can be legitimately assigned for failure to publish the government estimate on levee projects in the call for bids. If the government estimate is below what the contractor thinks is his lowest price, he need not bid on the work, and would thereby save the cost of field investigation, railroad fares and bid bonds. His expense of bidding, which has to be made up when he does get a contract, would eventually react as a saving to the United States. Where the contractor thinks that he can economically underbid the government on any piece of work, the government estimate would act as a check on a bid too low and he would investigate very carefully before underbidding the estimate.

It is incontestable that every time a contractor goes broke on levee work all other contractors raise their future bids on all projects, so that no benefit accrues to the United States in the final analysis. In fact, every time a contractor goes broke on government work the United States eventually pays his loss, many times over, through higher bids by other contractors, on all future projects of a similar nature.

Conclusions

I believe it can be stated, without fear of successful contradiction, that if the Mississippi River Commission should be eliminated as an active competitor of the bona fide contractors engaged in levee work, the flood-control program could be put through without friction with local interests, and with a saving of somewhere around a hundred million dollars, because the establishment of the commission and its engineers as a purely administrative and technical body would at one stroke increase their efficiency in their primary function, reduce the cost of levee construction by admitting all types of equipment suitable for the work, cause the engineers to exhibit a spirit of assistance instead of one of criticism, and build up a force of contractors who would be convinced that they would get a square deal, instead of feeling, as at present, that if they make any money it will be in spite of the government engineers rather than because of them.

While it is realized that the situation relative to government bidding on levee work cannot immediately be changed without appropriate congressional action, it is felt, in view of the statements of the present Chief of Engineers, that the entry of the government into the contracting business on the Mississippi River, especially under conditions giving it an unfair advantage over its own citizens engaged in this same line of business, should be discouraged in every possible manner and, if necessary, such steps as may seem advisable should be taken by Congress to enforce such a policy at the earliest possible moment.

I wish to conclude with the statement that all comment or criticism contained in this article is intended to be constructive and is submitted with a view to advancing the best interests of the government and contractor alike. These two interests are indivisible and inseparable, and there can be no constructive solution of this great engineering, economic and human problem—the greatest of its kind in the world today—within the ten-year period allotted unless the basic facts herein presented are recognized and constructively met now, in the very beginning of the work.

Water-Power Sites in British Columbia

Engineers of the British Columbia government have revealed tremendous possibilities for hydro-electric power production in the mountainous country from 180 to 350 miles north of Vancouver. Development in each case would necessitate turning the waters of certain lakes westward directly to the sea and barring their natural outlets easterly to the Fraser River. Preliminary reports indicate that in addition to the Taseko-Chilko-Homathko project, with a possible development of 1,200,000 hp., two other locations of similar nature have been discovered, bringing possible power production in the coast district up to 3,000,000 hp. The two new power sites, revealed by recent surveys, are at Tahtsa Lake and Eutsuk Lake. By turning these waters westward to the sea, engineers believe that 1,800,000 hp. can be developed.

The original scheme of this nature was the proposal to divert the waters of the Chilko and Taseko lakes from the Fraser River watershed to a new outlet by the Homathko River draining directly to Bute Inlet on the Pacific. Great storage dams and tunnels would be needed to carry the waters of these lakes, now reaching the sea by a roundabout route of 500 to 600 miles, over the proposed route of only about 50 miles to salt water. The location of this unique scheme straddles the backbone of the coast range of mountains. Tahtsa and Eutsuk lakes are somewhat similarly situated, topographically and with respect to their natural drainage, but the new region of prospective development is some 200 miles farther south.

New York Subway Construction—III

Excavation and Support of Structures in Open-Cut Subway

Motor-Truck Haulage Direct From Power Shovels—Bulk of Drainage Readily Accomplished by Sumps and Ditches—Under-Street Conduits Carried by Street-Decking Structure—Buildings and Elevated Railways Demand Full Resources of Underpinning Experience

EXCAVATION—the actual moving of earth and rock from trench—in open-cut subway is notable for the extent to which modern power equipment is utilized. This is true not merely in the use of power shovels loading motor trucks at the face but in the use of mobile cranes operating from the surface, of truck-size elevators, of well-point drainage equipment, portable compressors, jackhammer drills, and welding and cutting units. This mechanization is made possible by the development of open staging for street decking as described in a previous article (*Engineering News-Record*, Sept. 4, 1930, p. 371) and equally by equipment invention and improvement. The manufacturers of equipment, who in the decade following the major operations of the second subway system have produced the small power shovel, the motor truck, the mobile crane, well-point drainage units and a host of other tools not previously developed, deserve large credit as contributors to subway progress. —EDITOR.

OPENING the subway cut is a succession of operations embracing excavation proper, construction of decking structure, support or diversion of under-street utilities and underpinning buildings and over-street structures. These operations proceed simultaneously and largely in conjunction. The decking-girder framing and the support of utilities are disposed of generally in the first 10 ft. of excavation. Then posting down the decking, trench-side support and underpinning go on with the excavation in an order of time and place determined by the local conditions. These cause so many variations in the order of operations that any attempt at description results only in confusion. As a broad generalization the order is always such that operations which guard from hazard precede operations which cause hazard. For example, underpinning precedes undermining by excavation. The several operations are now considered separately.

Excavation and Spoil Removal

The materials excavated are broadly earth and rock. The rock is a schist, something solid and stable but often treacherous, where the cutting of inclined strata makes bracing against slides necessary. In a few instances damaging slides have occurred. Subway earths range the catagory of clays, gravels, sands and silts, some of them treacherous when carrying water. When drained, all of them are easy to handle and bracing is rarely difficult.

Excavation in the 1900-1904 subway work was a manual operation except for drilling and blasting rock and the use of power hoists. This practice continued to a somewhat lesser extent in the construction of the second system (1914-1918) and throughout later supplementary line construction until the very last—before the present subway operations. On this work from the beginning power shovels or cranes with clamshells have replaced hand shovels for excavation on practically all operations. Where hand excavation is absolutely necessary because of interfering structures, belt conveyors are used for transporting and loading the spoil. The

FIG. 1—CLAMSHELL EXCAVATING FROM THE SURFACE ON BROOKLYN SUBWAY

Nassau St. contract in lower Manhattan is the only subway work under construction where no power-excavating machinery is being used, the local conditions making the use of such machinery impracticable. This general use of power excavators, with the long-span decking structure described in the preceding article, is the capital development of the constructors of the third subway system.

An essential element of this advanced excavating procedure is the practice of running trucks directly to the point of digging to eliminate rehandling excavation. The older methods of transporting spoil to a shaft in skips or cars, hoisting it to the surface, dumping it into overhead bins and finally into trucks for disposal are rarely employed. Trucks are taken into the cut by ramps and by elevators. The ramp system, developed on the Philadelphia subways, is being used on the majority of the operations.

Wherever possible, ramps are built within the net lines of the subway excavation so as not to disturb additional street surface. In many locations, however, this is not practicable, because the ramp exit would interfere with traffic. Then the ramps are carried down from side streets at right angles to the subway cut or in private property secured by the contractor. Grades of 15 per cent are standard for the ramps. Ramps built in the subway trench are usually carried on steel or timber bents, though occasionally earthfills or excavated slopes are used.

Elevators capable of handling 7-cu.yd. trucks fully loaded are coming into use in congested areas or where ramps are not suitable. These are constructed in shafts sunk to subgrade and are equipped with automatic operating and safety devices similar to those provided in permanent freight elevators in buildings.

In all cuts except rock, runways must be maintained for the trucks. Sometimes planks are used and sometimes two 24-in. I-beams laid flat form tracks for the truck wheels. Occasionally the concrete floor is used

as a roadway. The width of cut governs whether one or two runways are used. It is rarely possible to arrange runways so that the trucks do not have to be backed in. After excavation is completed the ramps and elevators are used by the trucks carrying permanent construction materials such as concrete, structural steel and waterproofing.

Methods other than that of direct loading into trucks are occasionally necessary or desirable, especially where underground utilities, elevated railroad underpinning or street-decking supports interfere with truck operation. Then narrow-gage railways are used with different combinations of loading and disposal methods. Hand loading is employed where the yardage is small and the subsurface structures are many and close together. Small power shovels of the tunnel-mucking type are frequently used. Two methods are employed for raising the material to the surface—one is to hoist the skips or loaded cars and the other is to dump them into a pit in the bottom of the cut and keep the pit clean by a clamshell derrick or crane on the surface which dumps into waiting trucks or an overhead hopper bin.

Direct excavation by clamshells from the surface (Fig. 1) has been mentioned as being used on the Prospect Ave. section in Brooklyn. Sections on Eighth Ave. and Central Park West in Manhattan were excavated by means of traveling telphers. These telphers, resembling a traveling gantry crane, traveled along and parallel with the curb lines on the street level. Power shovels loaded skips in the cut, which were picked up by the telpher cranes, carried to one of the cantilever ends and dumped into trucks. Part of the excavating was done directly by clamshells operating from the telphers.

The first lift of the excavation is always made in the installation of the street decking, and it varies in depth from 3 to 12 ft., or to rock if its depth does not greatly exceed 12 ft. In excavating this first lift, subsurface utilities are temporarily taken care of, as will be explained later. Where the street decking has been built to provide for full use of power shovels and trucks, the remaining excavation is taken out in one or more lifts, depending upon the depth of cut. Cuts up to 30 ft. deep are often taken out in one lift (excluding the decking excavation).

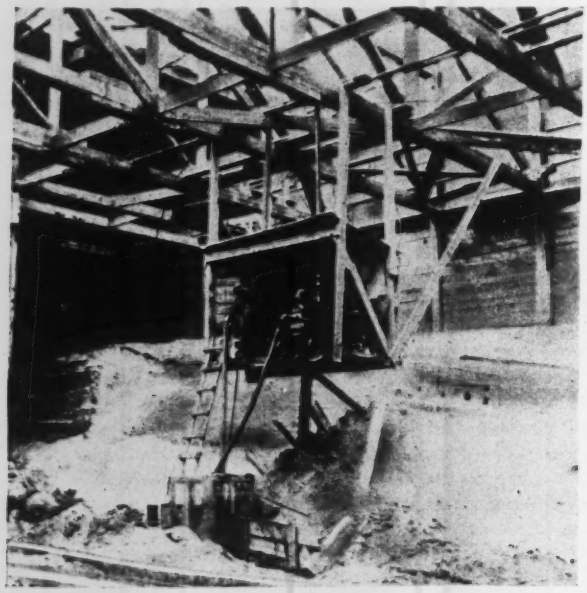


FIG. 2—GRAVEL-FILLED DRAINAGE PIT AND PUMPS ON SUSPENDED PLATFORM, HOUSTON ST., MANHATTAN

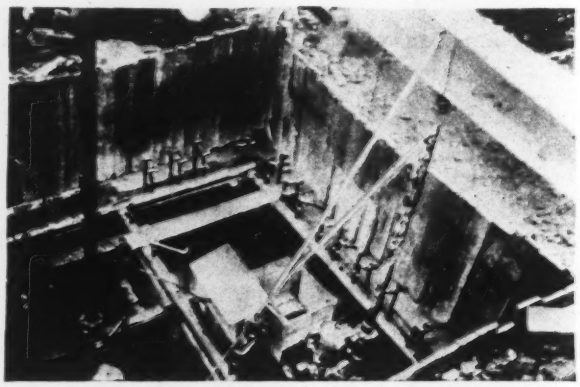


FIG. 3—DRAINAGE PIT CONTAINING 30 WELL POINTS, BROADWAY, ELMHURST, QUEENS

Virtually the same excavating and hauling methods are employed in rock and earth after the rock is broken by drilling and blasting. The rock-breaking procedure is ordinary, light charges being fired in jackhammer drill holes.

Disposal of excavated material is a problem in many parts of the city. As a considerable amount of material is required for backfill between the top of permanent subway structures and the street surface, many of the contractors co-operate in using the excavated material on one operation for backfill on another. The city uses some of the spoil for filling in low areas and for extending the shore lines of the rivers. Sometimes it is cheapest and most desirable to haul the excavated material to barges which dump it at sea. Special self-dumping barges have been developed for this work.

Drainage and Pumping

Groundwater is encountered at widely varying depths throughout the city. Some of the new subway sections are entirely above the water table, and on other sections water is found at levels from just under the street surface to the bottom of the cut. Contractors have given much thought and attention to handling groundwater and in general have settled on the practice of drying the ground ahead of excavation.

Each type of soil requires a different method of taking care of water. On some sections, in sandy soil, the contractors sink pits to subgrade at several points and start pumping early in the operation in an effort to lower the groundwater level in the vicinity of the job. Frequently this method is successful, but in Houston St., Manhattan, after several months of preliminary pumping, the contractor found he was not affecting the water level in the least.

Failing in preliminary pumping, the contractor first excavated the cut to groundwater level for some distance. Then trenches were dug 5 ft. deep leading to sumps made by sinking sheeted pits to below subgrade, placing a wire-screen frame inside the sheeting, filling the pits with coarse gravel and pulling the sheeting, leaving a porous sump. Pipes set in the pits previous to filling them with gravel were connected to electrically driven pumps and the sumps were kept pumped down. This method in sandy soil drained the cut so excavation could be carried on in 5-ft. lifts. One of these sumps with pumps located on a suspended platform is shown by Fig. 2. Similar methods have been employed at a number of other localities.

FIG. 4—THREE TYPES OF STRUCTURES CARRYING GAS BYPASS LINES

Well points are used extensively in draining sandy or porous ground; a typical installation is in use on a section of the Broadway subway in Elmhurst, Queens. Sheeted pits 18 ft. square were sunk to subgrade at intervals of 500 ft. along the line after the cut had been excavated to groundwater level. In each pit 30 points were driven 10 ft. below subgrade and connected with electrically driven pumps. This method is successfully keeping the remainder of the excavation dry. Fig. 3 shows a view of one of the pits from above.

In clays or tight soils the most common method of drainage is to dig open ditches below the level of the bottom of the lift being excavated and drain the ditches into sumps. From the sumps the water is pumped to settling tanks and repumped into the temporary sewer systems. In other cases, as in cuts on descending grades, where the water collects at the point of excavation, portable pumps are installed to keep the cut dry.

Gasoline and electrically driven centrifugal pumps predominate. Often the pumps are suspended from overhead bracing to keep them out of the way of construction operations.

Maintaining Under-Street Utilities

Taking care of the maze of subsurface utilities without interrupting their service is one of the most difficult jobs of open-cut subway work. Gas lines, live steam lines, water main, sewers, telephone, telegraph and power cables and duct lines, police and fire alarm systems and pneumatic mail tubes are all encountered when the street surface is removed. Many of these conduits have masonry manholes which must be either maintained or removed and replaced. Generally these utilities are temporarily taken care of and replaced in their original positions on top of the subway structure, though in some cases new permanent lines can be built around the subway structure.

Private lines are usually handled by the owners, with the help and co-operation of the contractor. The public-owned utilities, such as water pipes and sewers, are handled by the contractor under the supervision of the city departments involved.

Gas lines are bypassed outside of the subway excavation to avoid possibilities of trouble from leaking gas, this being the first step in starting actual construction. Temporary gas pipe is usually laid along the curb on top of the decking. At street crossings the gas lines are often carried on truss or suspension bridges high enough to clear traffic (Fig. 4).

Sewers are taken care of in temporary pipes, usually spiral-riveted steel. Wherever possible, all lines are hung from or laid on the framing of the street-support system. Manholes are temporarily dispensed with wherever possible, though sometimes they are left intact and held in place by the framing.

Underpinning Problems and Procedure

Every building not founded on rock along the open-cut routes is underpinned to below subgrade or at least to a depth intersecting a 1 on 1 slope line rising from the lower corner of the subway cut. Three methods of underpinning are in common use: jacking piles down under the building footings; sinking pits to be filled with concrete to form piers for carrying the building foundations; and inserting steel-beam needles under the foundations extending outside the footing line and resting on posts or piles. The first method was extensively used on the Nassau St. subway, and was described in *Engineering News-Record*, June 27, 1929, p. 1,018.

The pit-underpinning method is usually used on all light buildings and some of the heavier ones. Only the front line of footings or bearing walls and side walls for a short distance are underpinned, and care is taken not to lose any ground that would endanger the interior

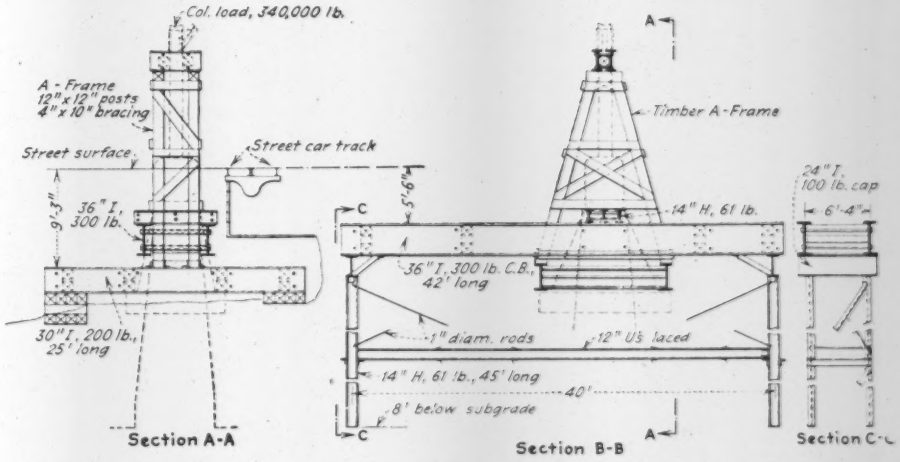


FIG. 5—DETAILS OF ELEVATED COLUMN UNDERPINNING, HOUSTON ST., MANHATTAN

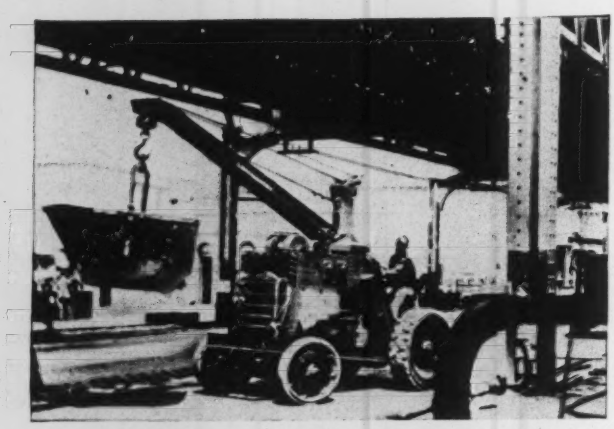


FIG. 6—TRUCK CRANE HANDLING EXCAVATION OR CONCRETE

footings and portions of side walls not underpinned. In sinking the underpinning pits, usually 4 ft. square, the procedure is to dig under the foundations at points far enough apart not to endanger the safety of the building. The pits are excavated by hand, using self-bracing horizontal sheeting. After the pits are deep enough they are filled with concrete and blocked to bearing against the building foundation. Alternate pits are then sunk in the same manner, until the building is properly underpinned. If the building construction permits, reinforced-concrete or steel beams are placed under the footings or front wall, spanning between concrete piers sunk as described above. This procedure reduces the number of pits required.

Methods of underpinning elevated columns vary greatly with the ground conditions and with their location in reference to the subway structure. These columns usually rest on shallow masonry piers. One method of underpinning is to build concrete or timber piers in sheeted pits, similar to those sunk in underpinning buildings, outside the four corners of the column foundation. The column load is transferred to these piers by beams or framing until the subway is excavated to grade, then a steel tower or concrete column is placed under the elevated column and the temporary supports are removed. If the elevated column lies within the limits of the final subway structure, the load is transferred to the subway roof when completed.

Fig. 5 shows the types of underpinning being used on Houston St. The first step is to place an I-beam collar around the column several feet above street level. A heavy timber A-frame resting on a steel grillage is then placed around the column and jacked up against the I-beam collar. Then the base of the column just below street level is cut away and three 14-in. H-beams are inserted under the column. Two bents of two 14-in. H-sections each are next driven down to 8 ft. below subgrade, 40 ft. apart on the center line of the column. Two 36-in., 300-lb. beams are then inserted under the 14-in. beams, spanning between the pile bents. The A-frames are then removed, leaving a clear space 40 ft. wide for working under the column. This wide space permits the building of the permanent subway structure at this point, after which the column load is transferred to the subway roof.

Still another column-underpinning method is being used on the Queensboro Plaza job in Queens, where two levels of elevated railway track are over a five-track subway line. Two six-pipe pile bents are driven alongside each column. Needle beams are then inserted one at a time under the concrete footing of the column, spanning between the piles. As the piles are uncovered during excavation, suitable crossbracing is installed, making in effect a tower structure under each elevated column.

Summary and Interpretation

Excavating and moving earth and rock in open-cut subway are established machine operations with the third subway system for New York. This advance is due largely to the development of the bridging type of street-staging structure in which the substitution of steel for timber is the major factor, but equipment invention has also contributed. Without the high development of small power shovels and cranes and the power and sturdiness of the modern motor truck there would be quite a different situation. Indeed there would have been little purpose in the radical improvement of decking structure.

Organization for Subway Construction

The board of transportation of the city of New York has charge of the design and construction of subways. John H. Delaney is chairman of the board. Robert Ridgway is chief engineer; John R. Slattery is deputy chief engineer; A. I. Raisman is chief designing engineer and H. N. Latey is chief electrical engineer. The organization is divided into the following seven divisions, with the division engineer of each named: design, C. E. Conover; division I (construction of lines in Manhattan below 57th St., and in Brooklyn), J. O. Shipman; division II (construction of lines in Manhattan north of 57th St., and in Queensborough and the Bronx), John H. Myers; tunnel division (all subaqueous tunnel construction, regardless of location), J. B. Snow; track, R. H. Jacobs; station finish, J. T. Kane; materials inspection, G. L. Lucas. Each section is in charge of a resident section engineer. Several sections are grouped under the direction of an assistant division engineer.

Better Office Seating

Active study of more efficient seating for office workers is now in progress, through a committee working in co-operation with the Taylor Society. Generally speaking, office workers spend more hours sitting down than do industrial workers. It is also probably true that a higher percentage of women, and perhaps a less robust type of person, are concerned, and both are more than ordinarily susceptible to the harmful influence of improper seating facilities. Until about five years ago, however, the subject received little attention; introduction of a posture chair then led manufacturers to study it. Soon afterward a committee of specialists was organized, with representatives of a number of large industrial and commercial concerns. Pauline Goldmark, of the American Telephone & Telegraph Co., is chairman. At the last meeting of the committee it was reported that Japanese engineers are interested in discovering and adopting improved seating facilities and asked that the committee extend its inquiry to such factors as arm rests, foot rests, desks, machines—in other words, the workplace taken in its entirety and in its relationship to the chair. Experiments by Dr. Wade Wright, assistant medical director of the Metropolitan Life Insurance Co., were also reported. These aim to determine seating requirements as dictated by the construction of the human body and its variations as found in different persons.

Deep Caissons on Brisbane River Bridge in Australia

THE river piers of the Grey St. bridge, under construction across the Brisbane River at Brisbane, Australia, rest on pairs of 28-ft. circular caissons sunk 96 to 115 ft. deep to rock through artificial islands. The bridge, with approach viaducts, is a reinforced-concrete structure 1,652 ft. long, spanning the river, 800 ft. wide, in three spans. Each of the two river bridge abutments is carried on a pair of rectangular piers 34x20 ft., going down to rock 84 ft. below water. The rock ledge

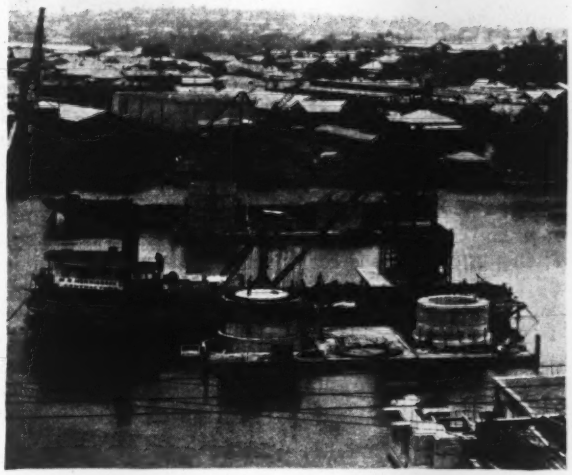


FIG 1—RIVER PIERS AND ONE ABUTMENT, GREY ST. BRIDGE, BRISBANE

is irregular, accounting for the difference in depth of the river piers and abutments.

Each of the four shafts carrying the two river piers were constructed by driving steel sheet piling as a cylinder 30 ft. in diameter, and filling the cylinder with sand to create an artificial island (Fig. 2). A steel cutting edge, 28 ft. in diameter, was then placed on the sand and a concrete caisson, built in 6-ft. sections, was sunk to rock by the open-dredging method. When the cutting edge reached rock, the caissons were filled with concrete, leaving two shafts, one for a material lock and the other for a man lock. Air was then put on the caissons and the cylinders were sunk into rock for a minimum distance of 5 ft.

Working pressures under air varied from 35 to 50 lb., but as yet no serious cases of bends have developed.

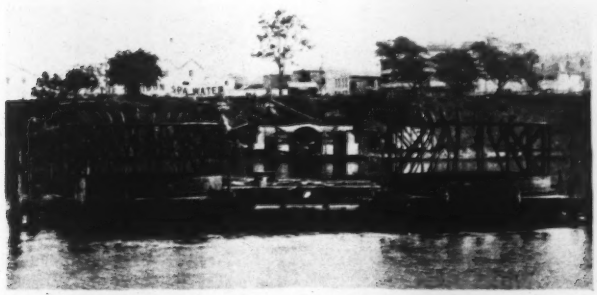


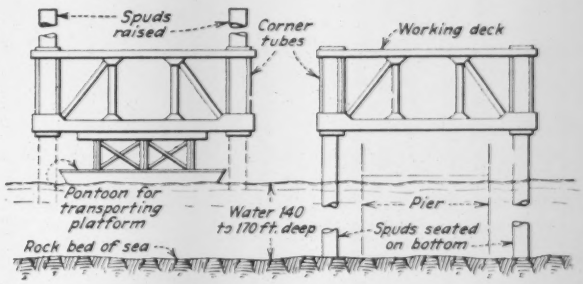
FIG. 2—CUTTING EDGES OF CAISSONS FOR ONE RIVER PIER READY FOR CONCRETE
Sheet pile cylinders forming artificial islands for caissons can be seen.

The caisson workers are carefully selected men. Work under air is carried on by sixteen shifts a day of 1½ hours per shift. Construction commenced last year and three years' time is allowed for completion. M. R. Hornibrook, Ltd., has the contract on the project, valued at $1,000,000.

Building Deep-Sea Bridge Piers

INGENIOUS methods of building bridge piers in open sea at depths up to 170 ft., as proposed some 40 years ago for a 21-mile bridge between England and France, are brought to mind with the revival of the old Channel tunnel scheme (see *Engineering News-Record*, April 17, pp. 636 and 658). The project for this bridge, with 1,640-ft. cantilever spans alternating with 1,312-ft. spans composed of pairs of anchor arms, originated with the French engineers Schneider and Hersent in conjunction with Sir Benjamin Baker, the English engineer. Each of the 72 piers was to be 165x72 ft. at low-water level, tapering to a base 200x120 ft. at the maximum depth of 170 ft. and rising 70 ft. above water to carry a pair of 26-ft. built-up cast-iron towers 135 ft. high, connected by bracing. Soundings indicated a clean rock bottom.

According to a description published in book form in 1893, steel caissons were to be built, stiffened by interior trusses and having a deck 6 ft. from the bottom to form a buoyancy chamber divided into several compartments,



PLATFORM FOR PIERS IN OPEN SEA
At left, platform floated into place; at right, platform set up on spuds.

each with air-lock connections. With a 7-ft. bed of concrete on this deck, the caisson, drawing 35 to 40 ft. was to be towed out and sunk by filling with concrete. While being sunk the caisson was to be held by cables from anchored pontoons; when its edge approached above the rock, it was to be seated by admitting water ballast to chambers in the concrete. It was contemplated that men would then enter the working chamber to trim the rock bottom. Concreting was to be done by hand or through chutes.

Alternative methods were proposed, in view of difficulties in sinking these huge caissons, nearly 200 ft. high and weighing 60,000 to 80,000 tons. From a working platform 210x180 ft. supported by four huge spuds 26x13 ft. in horizontal dimensions, concrete was to be placed under water in steel forms to build up a footing in a series of steps 10 ft. high. When this concrete base was within 80 or 100 ft. of the water surface, a steel caisson could be sunk upon it for the upper part of the pier. Another plan, using a similar platform, was to place a row of eighteen steel columns, 6 ft. square, around the perimeter of the pier as guides and attachments for precast concrete blocks weighing about 160 tons each and laid like ashlar masonry. The interior of the pier was to be of dry rubble masonry grouted under pressure.

Operating a 24-In. Butterfly Valve Under a Head of 223 Ft.

Torque and Flow Measured Under Free Discharge to Determine Feasibility of Flow Regulation With Valves of This Type

By Clinton DeWitt
Formerly Assistant Engineer, Pacific Gas & Electric Co., San Francisco

IN PLANNING equipment to be installed at the Salt Springs reservoir, now under construction on the Mokelumne River in California, the Pacific Gas & Electric Co. considered whether butterfly valves of large capacity could be used in place of the more expensive needle valves for controlling the free discharge flow from the outlet tunnel. The scarcity of published data on the behavior of large butterfly valves under high head and the forces to be dealt with during free discharge, as well as the lack of agreement in the limited data available, led to the decision to make a series of tests under actual operating conditions. Accordingly, a butterfly valve was installed in an outlet through the Spaulding dam where tests could be made on various factors involved in operation under a head of 223 ft. The equipment used, the methods of testing and the results obtained are outlined in the following.

The drainage outlet tunnel in Spaulding dam which

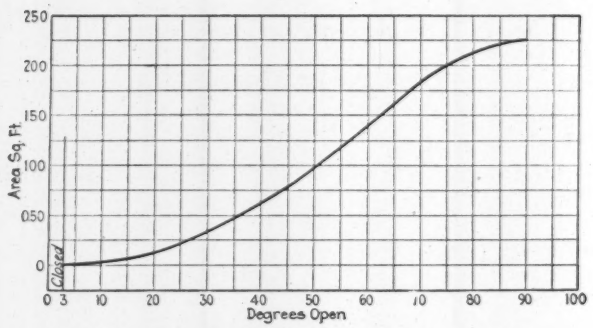


FIG. 2—RELATION OF NET VALVE AREA TO DEGREES OF OPENING

was used for these tests extends from the downstream face horizontally to a point 32 ft. from the upstream face. Installed in the tunnel is 160 ft. of riveted steel pipe, 30½ in. in diameter, of which the first 32 ft. from the upstream face of the dam is embedded in concrete, having been built in when the dam was constructed. The remainder of the pipe lies on the tunnel floor, where it is readily accessible. The butterfly valve to be tested, which had an inside diameter of 24 in., was installed just inside the downstream end of the tunnel and was connected to the discharge end of the steel pipe by a tapered section 8 ft. long.

In order to provide a simple inexpensive means of operation that would at the same time eliminate the friction of the usual operating mechanism, a sheave 4 ft. in diameter was keyed to the end of the butterfly valve

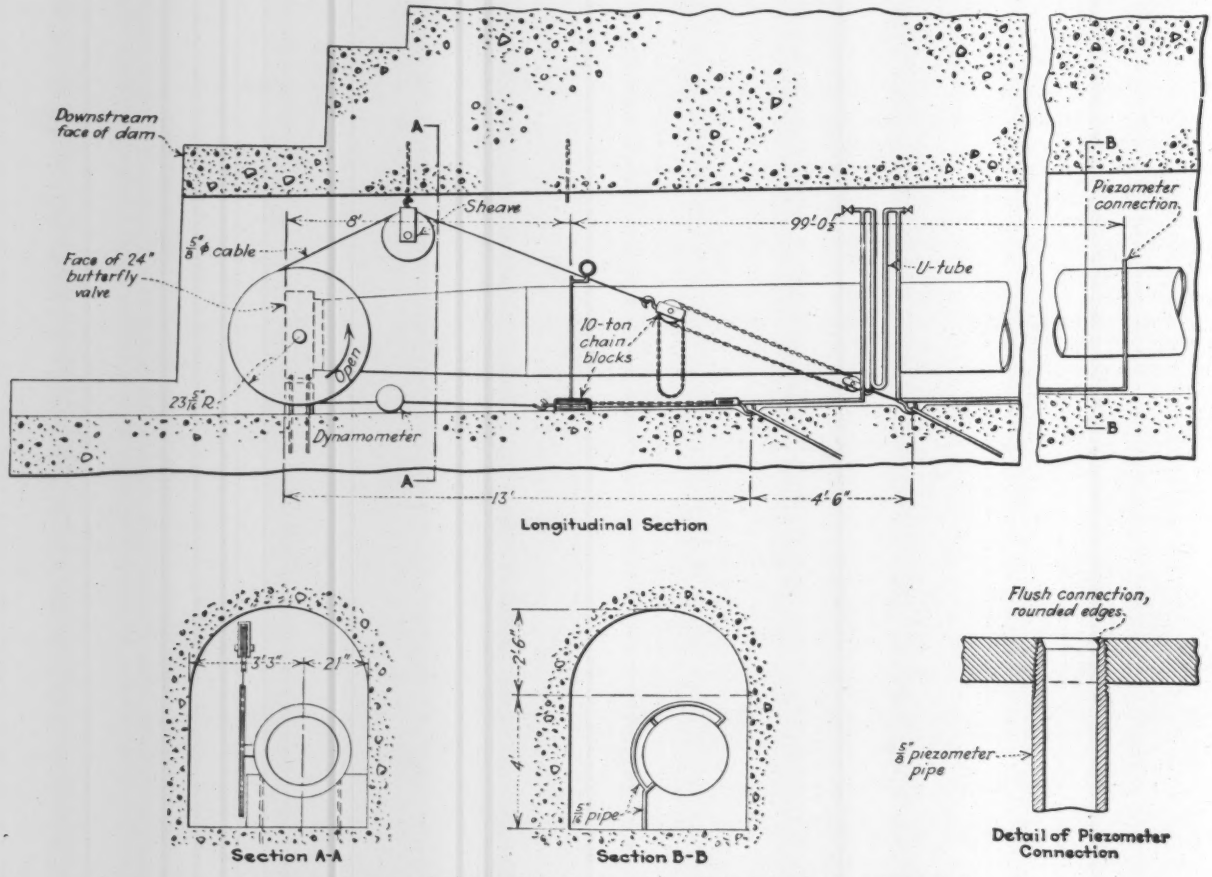


FIG. 1—DETAILS OF RECORDING AND VALVE-OPERATING APPARATUS

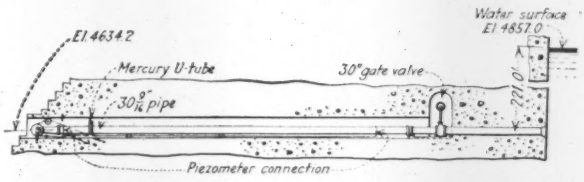


FIG. 3—SECTION THROUGH LOWER OUTLET TUNNEL, SPAULDING DAM

snaft. Thus the valve could be actuated by direct pulls applied to this sheave by cables, as shown in the accompanying drawing. Two $\frac{5}{8}$-in. cables were passed around this sheave in opposite directions so a pull could be applied for either opening or closing. Each cable was firmly clamped to the sheave, and for safety in operation only a small amount of slack was allowed when changing tension from one cable to the other.

The cable previously had been calibrated in the laboratory to a Martin-Loomis dynamometer which was used to read the cable tension. The torques required at a certain percentage of gate opening for opening and for closing operations were recorded and the average was used to obtain the pure hydraulic torque on the gate leaf, with shaft journal friction eliminated.

A piezometer ring was installed at a point just above the valve in the 30½-in. pipe and another was installed 99 ft. upstream. The connections to these rings were led to a U-tube containing mercury. In addition, the lower piezometer ring was equipped with a pressure gage. Readings were taken on the U-tube, on the pressure gage and on the dynamometer at 5 deg. intervals during the opening and closing of the valve.

The initial and final pressure gage readings (with no flow) were checked against the lake surface elevation, and the correction thus found was applied to the intermediate readings of the gage. The static head on the valve at the time of the test was 223 ft.

A sharp-crested weir with two full end contractions was constructed in the canyon below, and the flow which passed through the valve at maximum opening was measured in this way. Readings for intermediate valve openings could not be obtained owing to the length of time required to obtain a satisfactorily uniform flow in the canyon.

All readings were taken up to the 83 deg. position of the disk, corresponding to 7 deg. from the wide-open position. The valve was opened 2 or 3 deg. beyond this point, but because of the lack of a positive mechanical control and also because the hydraulic torque resisting the opening movement drops off very rapidly in this position, the disk began to flutter and was closed back to the 83 deg. mark. This tendency to flutter did not set up a serious vibration and would undoubtedly disappear were a positive geared control used instead of the cable. The cable control was easy to handle and the tension could be measured accurately at less than the maximum opening. When reversals of hydraulic torque on the disk began to occur as full opening was approached, this improvised equipment was not suited to steady control.

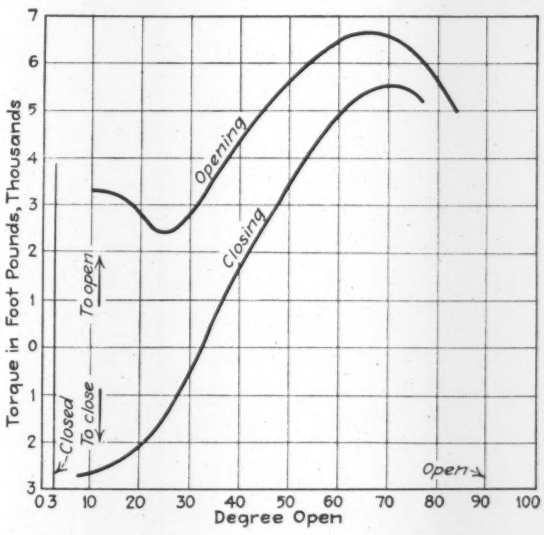


FIG. 4—OPENING AND CLOSING TORQUES AS RECORDED

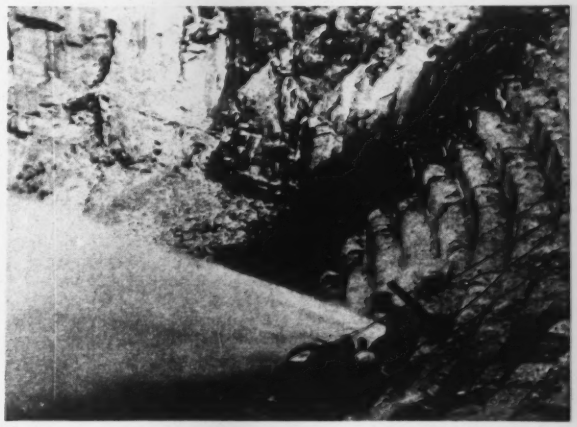


FIG. 5—FLOW FROM VALVE, DOWNSTREAM FACE OF DAM
Face discharge at 83 deg. opening from a 2-ft. butterfly valve under a head of 187 ft.

The flow recorded for the maximum opening (83 deg.) was 201 cu.ft. per second. The corresponding pressure gage reading was 64½ lb. per sq.in. From a graph of net valve opening area plotted against valve position (Fig. 2) a net area of 2.19 sq.ft. was obtained for the maximum opening. The coefficient of discharge for this opening, which should be very close to the coefficient for full opening was calculated as follows:

Velocity through net valve area = 201 ÷ 2.19 = 91.7 ft. per second.
Velocity in 30½-in. pipe = 201 ÷ 5.1 = 39.5 ft. per second.
Gross head at lower manometer ring = pressure head + velocity head.
= 64.5 × 2.31 + (39.5² ÷ 64.4)
= 148.5 + 24.2 = 172.7 ft.
Theoretical spouting velocity corresponding to head of 172.7 ft. = $\sqrt{64.4 \times 172.7}$ = 105.3 ft. per second.
Coefficient = 91.7 ÷ 105.3 = 0.87.

The manometer reading corresponding to the 83 deg. position was 20.4 in. of mercury, or 23.1 ft., which represents the head loss in 99 ft. of the 30½-in. pipe. This pipe is made of $\frac{5}{16}$-in. plate, is double-riveted and has lap-joints. The head loss shown corresponds to a value of n (in Kutter's formula) of approximately 0.013.

The maximum net operating tension in the cable during the opening movement was 3,400 lb., which occurred at the 73 deg. position. The corresponding net tension during the closing stroke was 2,850 lb. The average net tension was 3,125 lb. applied at a lever arm of 1.945 ft. on the valve shaft; thus the net hydraulic torque in foot-pounds with friction eliminated was 6,100. With friction the maximum torque required for operation was 6,600 ft.-lb. In Fig. 4 is plotted the net

tension required for the opening and the closing strokes. It will be noted that the values for the 63, 68 and 73 deg. positions were practically the same, but on either side the values drop off very rapidly.

If these values are used in the formulas advocated by E. A. Dow (see "Penstock Valves," published by the National Electric Light Association, 1929), the following coefficients are obtained:

(*a*) The flow for the 73 deg. position gave a friction loss of 18.4 ft. for 99 ft. of the 30½-in. pipe. Using n (in Kutter's formula) equal to 0.013, a velocity of 36 ft. per second is obtained corresponding to this head loss. The flow in cubic feet per second is then 183.5.

(*b*) The pressure head at the lower piezometer ring corresponded to a head of 167.5 ft. and the velocity head in the pipe was 20.1 ft., making a total head of 187.6 ft. just above the valve.

(*c*) For the formulas

$M_H = K_H V^2 D^3$ and

$M_{H+F} = K_{H+F} V^2 D^3$

Where

M_H = maximum net hydraulic torque acting on the valve shaft; and

M_{H+F} = maximum hydraulic torque combined with journal friction acting on the valve shaft

V = velocity through projected net area at the valve;

D = diameter of valve; and

K_H and K_{H+F} are coefficients corresponding to M_H and M_{H+F}.

Substituting the measured values of K_H and K_{H+F}:

$6{,}100 = K_H \times 94.5^2 \times 2.0^3$, or

$K_H = 0.853$

$6{,}600 = K_{H+F} \times 94.5^2 \times 2.0^3$ or

$K_{H+F} = 0.924$

(*d*) For the formulas

$M_H = C_H H D^3$

$M_{H+F} = C_{H+F} H D^3$

Where M_H and M_{H+F} and D are as in section (*c*), and

H = total head just above the valve.

C_H and C_{H+F} are constants corresponding to M_H and M_{H+F}

Substituting measured values,

$6{,}100 = C_H\ 187.6 \times 2.0^3$, or

$C_H = 4.06$

$6{,}600 = C_{H+F} \times 187.6 \times 2.0^3$, or

$C_{H+F} = 4.40$.

Thus it appears that the torques under free flow required for the operation of butterfly valves are smaller than is generally believed to be the case from earlier empirical formulas. Moreover, these torques can be controlled by operating mechanisms of reasonable size. During the experimentation on the valve described above and also on a valve 48 in. in diameter previously tested under free flow by the Pacific Gas & Electric Co., at no position of the disks was any serious vibration apparent. The use of butterfly valves for free discharge is therefore believed to be justified, and the resultant economy may dictate their selection over types now commonly employed.

The tests were laid out and conducted by the division of civil engineering of the Pacific Gas & Electric Co., A. H. Markwart, vice-president in charge of engineering, and I. C. Steele, chief, division of civil engineering.

Cross-Connections Survey in Missouri

To secure data on the number and types of cross-connections between public and private water supplies the Missouri state board of health has addressed a questionnaire to each water-works superintendent. A cross-connection survey is suggested before the answers are made. Regulations of the board permit no physical connections between potable supplies and that of any other supply except with a supply approved by the board. Attention is called to the liability of officials for damages from a contaminated supply due to cross-connections.

Weather Influence on Mapping by Airplane

Best Time, Season and Cloud Conditions as Learned Through Experience—Effect of Special Requirements

By E. H. Corlett

Engineering Manager, Fairchild Aerial Surveys, Inc., New York City

ATMOSPHERIC conditions for aerial photographic mapping are best during the entrance of an atmospheric high-pressure area. High-pressure areas and low-pressure areas, called highs and lows, follow each other generally eastward across the country alternately but in the main unpredictably save within broad limits. When a high enters, the wind is usually from somewhere in the quadrant west to north and is comparatively brisk; the air itself is clear and crisp. The wind may have gale velocity on the ground; and when it does, its velocity at altitudes of 10,000 to 15,000 ft. may be such that the best photographic airplanes can make little if any headway following lines either against it or across it.

East of Colorado and from latitude 36 deg. northward, photographic days occur more frequently during May and early June and during latter September and all of October than during any other similar period throughout the year. This statement is of probabilities only, considering a period of years; further, there may be minor local variations; but the implication is that requirements should be anticipated to the utmost possible extent to insure obtaining the finest map product at least expense. Lower costs follow from the fact that, when photographic days occur frequently, the contractor need not set up as large an allowance for tie-up of airplane and crew; also, general conditions are such that work can otherwise be done more expeditiously. The matter of fine appearance of the photograph is primarily fixed by the amount of useful light—reflections from ground objects—which the photographer has available for his determination of exposure, diaphragm opening and filter.

Desirable Conditions—For the best aerial photographic work the following conditions should obtain:

(*a*) Time: 10 a.m. to 2 p.m., local sun time, succeeding and continuing an early morning period of conditions (*b*), (*c*) and (*d*) below.

(*b*) No clouds at all or very thin clouds over 15,000, known as high overcast.

(*c*) Negligible ground haze. Objects in all directions should be sharp and clear at a distance of 2 miles; the sky should be clear blue, not at all "milky:" shadows should be sharp-edged and sun-lit objects brilliant.

(*d*) Negligible industrial haze. Ground haze, being water particles, can be cut by use of filters; smoke and dust, being solid particles, cannot. Industrial haze cannot be controlled on any but very small areas. Its effect can be minimized by working on Sundays and holidays, and on days when wind blows it away from the area to be mapped.

Results of Other Conditions—The effects on photography when conditions are not ideal are, in order as listed above:

(*a*) Diminished intensity of illumination begins to be

MAP PHOTOGRAPH OBTAINED THROUGH VERY HEAVY HAZE

MAP PHOTOGRAPH OBTAINED THROUGH NEGLIGIBLE HAZE

noticeable more than two hours away from local noon; and shadows are longer. Aerial negatives are thinner; this can be compensated for by choice of emulsion and chemicals so that a thoroughly usable product is obtained, but "the best photographs are those properly printed from *correctly exposed* negatives."

(*b*) While ground covered by cloud shadows can be studied photographically, interpretation is not so readily accomplished; besides, the map is not pleasing in appearance, being spotty. The comment in (*a*) immediately above, concerning thin negatives, applies with equal force to conditions of heavy high overcast. Sometimes, however, especially in the summer when light is at its best, a fairly heavy high overcast is an advantage in photographing steep valleys or city streets, where dense shadows would otherwise occur.

(*c*) The heavier the ground haze the smaller the amount of effective light that can reach the sensitive emulsion of the film. Quite a bit of light, of shorter wave lengths (toward the blue end of the spectrum), is reflected not only from ground objects but from the haze particles, and therefore not only serve no useful purpose but must be prevented by orange filters from reaching the film. This may result in underexposure (which has been discussed above as thin negatives) and, under bad haze conditions, in generally flat, dull, mushy photographs.

(*d*) Smoke and dust have an effect roughly similar to that of unfiltered haze; when either is very dense, ground detail is altogether lost. Single smoke streamers are not so bad, for they obscure different areas in different exposures, because the viewpoint is shifted, and all of the ground can therefore be studied on one photograph or another.

Stated thus baldly on paper, these obstacles may appear to be quite discouraging. However, aerial photographic map products are made for use; and with modern technique thoroughly usable products can be made under very discouraging conditions.

Special Conditions—Contracts made late in the fall or late in the spring and specifying neither leaves on trees nor snow on the ground are particularly trying, because of the weather hazard. Photographs required to be made under special conditions, such as low or high tide, are very troublesome, in that clear weather and uncertain specified events must occur simultaneously. All a contractor can do is to use his best judgment in obtaining sufficient satisfactory aerial negatives.

This leads to another phase of this subject which sometimes causes strained relations between the contracting parties. It is possible for the contractor to take advantage of every small interval—an hour or less—of perfect photographic conditions, by having his crew and equipment over the area to be mapped every day between proper hours, and this would undoubtedly speed production of aerial negatives. But, as airplane operation is expensive, the cost of the work would be very much greater if such efforts were consistently made the routine of all projects.

As does all other practical engineering, aerial photographic mapping must maintain itself at the point of justifiable compromise between possibilities and practicalities—that is, where the cost-to-produce curve crosses the value-to-user curve. The information herein given, by increasing the technical knowledge of the user of aerial photographic products, can bring about a better understanding between contracting parties, and to that extent may be of real benefit to engineers and the public they serve.

Bridges Insured in Alabama

The Alabama State Bridge Corporation, a quasi-public organization sponsored by the state, has purchased multi-risk insurance (so-called all-risk insurance) of both the property damage and use-and-occupancy nature, covering its fifteen new toll bridges. The property damage is carried to the extent of 80 per cent of the physical value, which is the minimum requirement, while the use-and-occupancy coverage is provided in amounts equivalent to the expected toll incomes. This insurance covers the following hazards: (1) fire and lightning, (2) tornado and winds, (3) earthquake, (4) flood, rising waters, and ice, (5) collision (on or under), (6) collapse, (7) riot, strike, civil commotion, malicious damage and explosion

Engineering Literature

A Monthly Review of Books and a Listing of New Publications

Italian Treatise on Hydraulics

REVIEWED BY I. GUTMANN
Associate Editor, Engineering Index, New York City

IDRAULICA: Basi Scientifiche e Applicazioni Tecniche—By Guilio de Marchi, Professore stabile nel R. Politecnico di Milano. Vol. I. Fondamenti-Idrostatica-Correnti a Pelo Libero e in Pressione Effulsso-Azioni Idrodinamiche-Acque Filtranti. Milan: Ulrico Hceple. Paper; 6½x9½ in.; pp. 560; line cuts in text and tables.

THE APPEARANCE of a new treatise on hydraulics is apt to be greeted with a skeptical shrug, for has not the production of texts on hydraulics and allied subjects become somewhat of a minor industry, with supply unfailing and more than meeting demand? But the skeptic is due for a pleasant surprise. Prof. Giulio de Marchi (Royal Polytechnic Institute of Milan) has achieved the increasingly difficult task of compiling a thoroughly comprehensive treatise, requiring no apologies, to say the least.

Only the first volume is before us, and there is no definite indication as to what the following volume or volumes may deal with, yet even a cursory examination of this volume is enough to make one realize that a truly welcome addition to the engineering literature on hydraulics has been made. The book is characterized by a genuinely scientific development of the theoretical foundations of the subject, logical arrangement and lucid exposition. Mathematical analysis is used without the least restraint—even vector analysis is had resort to in expounding the general principles of hydromechanics—yet the spirit of the book as a whole is emphatically different from that of the venerable "pure science" texts on hydrostatics and hydrodynamics, whose sterility the late lamented Clemens Herschel bewailed even in his will. On the contrary, the author frankly admits that he has followed the German Forchheimer and our own Mansfield Merriman in the general manner of presentation of hydraulic theory.

The book opens with a letter of commendation by Professor Senator Gaudenzio Fantoli, dean of the Royal Polytechnic Institute of Milan. In the preface the author reviews the progress of hydraulics from Galileo and Castelli to von Karman and Allievi; then follows a short discussion of the physical properties of water and the nature of liquid motion. The first chapter (65 pp.) contains a survey of the mechanics of continuous systems and its application to liquid motion. This, as well as some of the other strictly theoretical portions of the book, is largely based on the course of rational mechanics by Levi Civita, the researches of von Karman, etc. There is a strong chapter on the motion of viscous liquids and hydrodynamic resistance, and there are extensive up-to-date summaries of the still not quite resolved problems of hydraulic jump, water hammer, backwater curves, testing of hydraulic models, etc. The book also contains the usual chapters on flow of water in open and closed channels, discharge from orifices and over weirs, the dynamic effect of liquid streams, and on other subjects customarily presented in texts on hydraulics. It closes with a 55-p. chapter on the theory of the motion of underground waters. In all of these discussions the author presents the results of most recent hydraulic research in Germany, Great Britain, the United States and Italy. It is difficult to think of any engineering text which could be favorably compared to this book in the respects of international scope and familiarity with latest developments. Each chapter is followed by a list of international bibliographic references, which in itself is a feature of no little value.

Judged by his first volume, Professor de Marchi has succeeded in producing a work of great interest to both civil and mechanical engineers.

Public Works and the Economic Balance

PLANNING AND CONTROL OF PUBLIC WORKS: Report of the Committee on Recent Economic Changes of the President's Conference on Unemployment, Including the Report of Leo Wolman, of the National Bureau of Economic Research, Inc. New York: National Bureau of Economic Research, Inc. Cloth; 6x9 in.; pp. xxviii + 260; line cuts and tables. $3.

ONE of the measures lately proposed to preserve the "economic balance," or more specifically to prevent or relieve industrial depressions and unemployment, has been acceleration of public-works construction. To throw light on the practicability of this plan many data have been gathered by or for the National Bureau of Economic Research. They are here presented and interpreted in clear and orderly fashion by Leo Wolman. Although the study proves little as to the practicability of the plan just mentioned except that it is beset with difficulties, the book is nevertheless valuable. It shows the magnitude of public-works construction in total outlay; its distribution among federal, state and municipal governments; and, of great significance, the length of time which often elapses between the conception of a public improvement and putting it under construction, together with the factors that make for delay.

Among other things shown by the study is the difficulty of holding back public-works construction to afford work in time of depression, particularly in view of the fact that our cities are mostly far behind in meeting local needs. The brightest hope offered by the report seems to be in longtime advance planning of public works and of attendant financing. This, actually practiced of late in a few notable cases cited by Mr. Wolman, has two advantages: It tends to smooth out or distribute construction, lessening spurts, and if widely practiced would facilitate a countrywide speeding up of construction in such a time as we are now passing through.

The report would be valuable for its extensive classified data on construction volume, in terms of the dollar, if it contained nothing else. Add to this Mr. Wolman's analysis and interpretation and its significance is more than doubled.

Arctic and Antarctic Exploration

HEROES OF THE FARTHEST NORTH AND FARTHEST SOUTH—By J. Kennedy MacLean and Chelsea Fraser. New York: Thomas Y. Crowell Co. Cloth; 5½x8 in.; pp. 472; 32 illustrations and 34 maps. $2.

CONDENSED narratives of 75 expeditions to the Arctic and Antarctic regions are here presented in chronological order. The book was first written by Mr.

Maclean some years ago, then revised in 1923. Since then the airplane, the dirigible and the radio have been pressed into the service of the explorers of the polar regions. Chapters dealing with the half dozen years since 1929 have been added by Chelsea Fraser. They cover Byrd's flight to each pole by airplane, and the two North Pole dirigible flights, by (1) Amundsen, Ellsworth and Nobile and (2) by Nobile. Maps prepared by Mr. Fraser add materially to the present edition. A chronology includes 50 Arctic expeditions (982 to 1928) and 25 Antarctic expeditions (1567 to 1929).

Financing Municipal Improvements

PUBLIC BORROWING—By Paul Studensky, Ph.D., Lecturer on Public Finance, New York University. Foreword by Prof. Edwin R. A. Seligman, Columbia University. [National Municipal League Monograph Series.] New York: National Municipal League. Paper; 6x9 in.; pp. 137; charts and tables. $2.

UNLIKE several earlier works on public finance this book is brief. It offers a plan for financing municipal improvements, based on (1) a long-time financial program covering all foreseeable needed municipal improvements; (2) apportioning the cost of these improvements between loans and taxation; (3) making the yearly loans for all public improvements balance capital losses through depreciation and obsolescence. By pooling all loans instead of tagging each loan separately, unexpended loan balances and capital charges are kept down.

The book opens with chapters on "The Development and Present Scope of Public Borrowing" and "The Trend of Expenditures for Permanent Improvements." Next come chapters on "Defaults and Bankruptcies" (on bonds) and on "Legal Restrictions on Public Borrowing." There is a well-balanced chapter on "All-Loan vs. No-Loan Policy" and a short chapter on "Term of Loans." In the concluding chapters the author considers "Borrowing Combined With Taxation" and presents his plan as "A New Proposal." There is a selected bibliography.

An error appears in a footnote to p. 20 in which the author says: "When New York City built its first water supply in 1836-44 there was but one municipal water supply in the country." There were fifteen such in 1835, a year earlier than the first of the dates mentioned; twenty-three in 1840 and twenty-seven in 1845. On p. 93 occurs the curious expression, "the laying of standpipes." These are minor slips in a book of unusual excellence, which deserves widespread consideration in these days when huge and rapidly growing municipal debts and high taxation fail to supply the demands for public improvements.

For Using Aluminum Structurally

STRUCTURAL ALUMINUM HANDBOOK—Pittsburgh, Pa.: Aluminum Company of America. Imitation leather; 6x8 in.; pp. 106; line cuts and many tables. $1.

DURING the past half century the handbooks of the various steel companies have proved to be indispensable aids to structural designers. Since aluminum promises to be one of the principal new structural materials of the next period of our engineering development, it is natural and necessary that we have a similar guide for designing and using structural aluminum shapes. The authors of this new handbook have patterned its contents and arrangement after that of the existing steel handbooks, with which every designer is familiar. They have included the useful data on elements of sections and the formulas for determining such elements as radius of gyration, moments of inertia, and section modulus. Weights and area tables and tables giving shearing and bearing values of both aluminum and steel rivets in diameters up to 1¼ in. comprise other useful data. Suggested details for end connections and data for their design form another section which is immediately practical.

Four wrought alloys and three cast alloys are cited as being most adaptable to structural uses. The wrought alloys have the most general application, and of these the one designated as 17S, containing 4 per cent copper, 0.5 per cent manganese and 0.5 per cent magnesium, and another designated as 25S, containing 4.5 per cent copper, 0.8 per cent manganese and 0.8 per cent silicon, are most frequently used.

The shapes considered include angles up to 6x6x½ in., I-beams and channels from 3 to 12 in. deep, 10-in. car channels, with maximum web thickness of ½ in., H-beams from 4 to 8 in., and tees and zees. These sections constitute the sizes which present mills are capable of rolling, but include some for which rolls and dies are not yet on hand. Designers, therefore, should use the handbook in conjunction with up-to-date stock lists which the company can provide.

This structural aluminum handbook is an example of the type of useful publication which industry could profitably furnish more widely to the practicing engineer, builder and contractor.

Engineering Cost Accounting

REVIEWED BY JOHN H. GREGORY

Consulting Engineer, Professor of Civil and Sanitary Engineering, Johns Hopkins University, Baltimore, Md.

COST FINDING FOR ENGINEERS—By Clarence Reitell, Ph.D., Professor of Accounting, University of Pittsburgh, Consultant on Standard Costs and Budgetary Control, and Clarence Van Sickle, M.A., Assistant Professor of Accounting, University of Pittsburgh, Associated with Sheppard & Co., Certified Public Accountants. New York and London: McGraw-Hill Book Co., Inc. Cloth; 6x9 in.; pp. 518; 13 charts (11 tabular, 2 diagrammatic) and 85 illustrative accounting forms. $5.

AS STATED by the authors, this book has been written with the definite and avowed purpose of providing a textbook for engineering students who are beginning the study of cost accounting. The material embodied in the book has been offered for two years at the University of Pittsburgh in cost-finding classes for engineers, and in it are presented those elementary principles of accounting upon which accurate cost findings are based. In the preparation of the volume a large number of executives of Pittsburgh industries, with their engineers and accountants, not only have given much of their time and advice but have permitted the use of forms taken from their own establishments.

Following a brief 4-p. introductory chapter, the book is divided into five parts. Part I, 175 pp., is devoted to Accounting Technique; Part II, 39 pp., to Basic Valuation Principles; and Part III, 132 pp., to Factor Controls. The remaining two parts are brief; Part IV, 29 pp., deals with Revenue Accounts, and Part V, 5 pp., with The Outline of Advanced Cost Finding.

The book is primarily a textbook to be used in connection with guided discussion and instruction in the classroom, and, as such, appears to be well prepared. It is not a treatise nor can it be considered exactly a reference book on cost finding for practicing engineers. Nevertheless, practicing engineers, especially those connected with manufacturing and industrial concerns,

whether or not they are familiar with cost-finding methods, will find the book an interesting one.

At the end of each chapter, other than the first and the last, is given a list of questions (430 in all) designed to test the student's grasp of the subject as presented. It is by the working out of these problems that the student will get a grasp of the principles of cost finding which the authors have undertaken to set forth.

The book is a good one, is well written and readable, and for a first edition is remarkably free from typographical errors. It is well printed and bound and the paper is of such a texture, not calendered, as not only to be easy on the eye but also to permit the easy writing of pencil notes, a feature much to be commended. The index is brief (6 pp.). In a second edition of the book the reviewer suggests that where reference is made to various chapters, sections, forms and charts, the page be added, for quick reference. A list of the forms and charts used would add to the value of the book.

British Water-Works Annual

THE WATER ENGINEER'S HANDBOOK AND DIRECTORY, 1930: A comprehensive guide to the Water Undertakings of Great Britain and Ireland and the Overseas Dominions. London: *Water and Water Engineering*, 30 Furnival St., E.C. 4. Cloth; 5x8 in.; pp. 343 + 43 pp. of advertisements. 9s. in England.

THE second issue of this useful annual has its directory portion extended by the addition of an Overseas Section which contains some particulars regarding waterworks in Canada, Australia, New Zealand, Tasmania and British South Africa. The handbook section, consisting of technical information, has been revised. The first issue of the book was noted in these columns on Sept. 19, 1929, p. 469. Data on water consumption and treatment given in the first issue were summarized in *Engineering News-Record*, Sept. 26, 1929, p. 497.

Reinforced-Concrete Structures

REVIEWED BY LEON S. MOISSEIFF
Consulting Engineer, New York City

REINFORCED-CONCRETE CONSTRUCTIONS: Systematic Course, Part I, Theory of Elements of Construction—[Printed in Russian]. By I. S. Podolsky, Professor Moscow Institute of Transportation, Moscow. U.S.S.R.: Transpetchat NKPS. Cloth; 6x9 in.; pp. 508; 236 line cuts. 3 rubles ($1.50), postage included.

PROFESSOR PODOLSKY has just issued the first volume of his Systematic Course on Reinforced-Concrete Construction. The second part of this work was published about a year ago and was reviewed in these columns Jan. 16, 1930, p. 117. Part I is a closely printed volume of more than 500 pp. which treats of the theory on which the design of the main elements of reinforced-concrete structures is based. The author discusses in a concise manner reinforced concrete in general and the design of columns and struts, beams and slabs. He then treats of combined stresses and the proper design for shear and torsion. Considerable space is devoted to the design of slabs supported on their full perimeter.

It is to be regretted that the author does not seem to be as familiar with American experiments and experience as he is with European practice. American tests on reinforced concrete made during the last decade have the great distinction of having been planned on a large scale, clearly conceived and carefully carried out. Altogether the author displays a decided leaning toward French engineering methods.

The book conforms to the rules and specifications for the design of reinforced-concrete structures adopted by the Committee of the NKPS (Commissariat of Transportation), 1926. The author contributes a valuable chapter on the exact computation of slabs resting on their full perimeter. After discussing the derivations by Grashoff, Navier, Marcus and the Russian specifications, the author proposes a simplified deduction. He also shows combined diagrams of the coefficients computed according to the above theories.

The book offers to Russian students and engineers a concise and clear textbook on reinforced concrete. It is a welcome addition to earlier works by Professor Podolsky, favorably noticed in *Engineering News-Record*.

Structural Welding Shown Pictorially

STAHLBAU—Von Dipl.-Ing. Otto Bondy, Gesammelt and Herausgegeben vom Fachausschuss für Schweisstechnik im Verein Deutscher Ingenieure und Werbeausschuss für Elektroschweissung E. V. (Ausgewahlte Schweisskonstruktionen, Band 1.) Berlin, N. W. 7: V.D.I.—Verlag G.m.b.H. Cloth (loose-leaf binder); 8½x11¾ in.; pp. 100; 12 marks.

THE WELDING committee of the Verein Deutscher Ingenieure here presents 100 plates of line cuts and halftones showing examples of structural welding gathered from many countries. The United States is liberally represented. Besides explanatory notes on the plates, the volume contains a classified list of the structures illustrated, giving location, date, builder and where described. A 3-p. prefatory discussion of welding procedure and stresses is contributed by Dipl.-Ing. Otto Bondy.

Three Centuries of Town Government

TOWN GOVERNMENT IN MASSACHUSETTS (1630-1930)—By John Fairfield Sly, Lecturer on Government, Harvard University, Cambridge: Harvard University Press. Cloth; 6x8 in.; pp. 244; $2.50.

THREE centuries of that unique New England institution, town government, in the state where it orginated are passed in historical and critical review by Mr. Sly. That the institution has persisted in a densely populated manufacturing state, with the native-born element in its population a decreasing minority, is remarkable. A Mid-Western state as densely populated as Massachusetts would have 200 to 300 cities, divided into a half dozen classes. Massachusetts had only 39 cities when this book was completed.

Those who do not know New England will be surprised to learn that all the 316 Massachusetts towns, regardless of size, still determine policies and expenditures in town meeting, with only fifteen of the 316 that have adopted the limited or representative town meeting. Even this change waited until 1915, Brookline with a population under 34,000 being the first town to adopt the new plan. This does not mean that through nearly three centuries town government in Massachusetts has remained unchanged otherwise. The town meeting remains, but its powers have been enlarged and with them the number of administrative town officials, the latter not few from the first. A few towns have provided town managers. Others have consolidated their administrative work.

The thoroughness of Mr. Sly's work in the Massachusetts field makes one wish he would cover the other New England states in the same way, broadening his study to consider the departures some or all of them have made from the Massachusetts type, and taking up the

functional aspects of the subject. A book dealing primarily with the functions of the town in all the New England states and with the functions of incorporated villages within towns, in the states where they exist, and with the relations between villages and towns in the states having villages, would be welcome. Even for Massachusetts, these functional matters are hardly mentioned by Mr. Sly and then chiefly as regards the administrative officials provided to deal with them. For this he cannot be blamed, since his book deals with the town as an institution and as such may properly disregard functions. This makes all the more desirable a book on functions and how far town government alone, or that supplemented by village government, goes toward meeting functional demands; and when the two combined need to give way to the city.

Elements of Business Management

THE SUCCESSFUL CONTROL OF PROFITS—By Walter Rautenstrauch, Consulting Engineer, Professor of Industrial Engineering at Columbia University. New York: B. C. Forbes Publishing Co., 120 Fifth Ave. Cloth; 5½x8 in.; pp. 239; illustrated. $3.

EVERY engineer has felt at one time or another the need for a text that will set forth clearly and swiftly the elements of business management. This Professor Rautenstrauch has provided in "The Successful Control of Profits." There is no point in discussing here the value of his book to the experienced and mature business executive; the fact remains that its substance and treatment commend it to the engineering reader who seeks a broad view of the subject. The chapters on "The Balance Sheet," "Measuring the Results of Operations" and "The Budget" alone would justify its presence in the working library of any engineer whose interests outreach the technical aspects of his profession.

Publications Received

A STANDARD TIME ZONE MAP of the United States and Adjacent Parts of Canada and Mexico, as of April 30, 1930, has been published by the National Bureau of Standards (10c. from Superintendent of Documents, Washington, D. C.).

A MODEL COUNTY MANAGER LAW appeared as a supplement to the August *National Municipal Review* and may be obtained for 10c. from the National Municipal League (261 Broadway, New York City), a committee of which drafted the model.

THE AMBASSADOR BRIDGE, opened last year for vehicular traffic between Detroit, Mich., and Canada, is the subject of a handsome pamphlet with the sub-title, a "Review of Its Construction as Told by a Phtographic Record of Its Progress," which may be had from the engineers and builders of the bridge, McClintic-Marshall Co., Pittsburgh, Pa.

RAILWAY SIGNALS of the semaphore and light types are the subjects of two illustrated pamphlets (70 and 40 pp.) issued by the signal section of the American Railway Association as chapters 12 and 13 of a treatise on signaling which is being issued as the several chapters are completed. Ten chapters (not consecutive) are now available (H. S. Balliet, secretary, signal section, 30 Vesey St., New York). The two new pamphlets are 25c. each to railway employees and 35c. each to others.

New Books and Revised Editions

[Those desiring copies of the books listed below or mentioned elsewhere in this section should order them from the publishers or from their local booksellers.]

ACTION OF ENZYMES ON SEWAGE SOLIDS—By Noel S. Chamberlin, Junior Chemist. Bulletin 500, New Jersey Agricultural Experiment Station, New Brunswick, N. J. Paper; 6x9 in.; pp. 35; diagrams.

APPRAISERS AND ASSESSORS MANUAL—By W. L. Prouty, Assoc.M.Am.Soc.C.E., member of Prouty Bros. Engineering Co., Denver; Clem W. Collins, C.P.A., Manager of Revenue and Assessor, City of Denver, member of Collins, Witting & Co., C.P.A.'s., Denver, Professor of Accounting, University of Denver; and Frank H. Prouty, M.Am.Soc.M.E. New York and London: McGraw-Hill Book Co. Cloth; 6x9 in.; pp. 500; many illustrations and tables; $5.

THE CORROSION OF STEEL BY BREEZE AND CLINKER CONCRETES—By F. L. Brady, M.Sc., A.I.C. London: H. M. Stationery Office. Paper; 6x9½ in.; pp. 15; halftones, line cuts and tables. May be had for 21c. from British Library, 551 Fifth Ave., New York City.

EROSION AND SILTING OF DREDGED DRAINAGE DITCHES By C. E. Ramser, Senior Drainage Engineer, Division of Agricultural Engineering, Bureau of Public Roads. Paper; 6x9 in.; pp. 55; halftones, line cuts and tables. 25c. from Superintendent of Documents, Washington, D. C.

ESSAI D'HYDROGÉLOGIE: Recherche, Étude et Captage des Eaux Souterraines—Par Le Dr. Ed. Imveaux, Ingénieur en chef des Ponts et Chaussées, Membre du Conseil superieur d'Hygiene Publique de France. Paris: Dunod, 92 Rue Bonaparte (VI). Paper; 8x11 in.; pp. 678; 352 line cuts and tables.

THE ESTIMATION OF FREE CALCIUM HYDROXIDE IN SET CEMENTS: A Calorimetric Method—By G. E. Bessey, B.Sc., A.I.C. Building Research Technical Paper No. 9, British Department of Scientific and Industrial Research. Paper; 6x9 in.; pp. 25; diagrams. 6d. from any H. M. Stationery office; 15c. from British Library of Information, 551 Fifth Ave., New York City.

EYES SAVED IN INDUSTRY: The Experience of 583 Companies. New York: National Society for the Prevention of Blindness, 370 Seventh Ave. Paper; 6x9 in.; pp. 24; halftone illustrations. 15c.

FIVE YEARS OF RESEARCH IN INDUSTRY, 1926-1930: A Reading List compiled by Clarence F. West. New York: National Research Council, 29 W. 39th St. Paper; 6x9 in.; pp. 91. 50c.

Articles classified alphabetically under some 80 heads, including Cement and Concrete, Civil Engineering, Construction, Corrosion, Fuels, Heating and Ventilation, Highway Engineering, Hydraulics, Iron and Steel, Sanitary Engineering, Transportation, Water, Welding, Roads, Timber and Timber Preservation. There is also a list of general books and articles.

FORCES AFFECTING MUNICIPALLY OWNED ELECTRIC PLANTS IN WISCONSIN—By E. Orth Malott. Studies in Public Utility Economics, Research Monograph No. 2, Richard T. Ely, Editor. Chicago: The Institute for Research in Land Economics & Public Utilities. Paper; 7x10 in.; pp. 101; line prints and tables. $1.50.

An intensive study confined to a single state, selected partly because Wisconsin was one of the first states to create a utility commission and this commission controls municipally as well as privately owned plants. Author concludes broadly that the same general conditions affect municipal as small private plants in Wisconsin.

FUNDAMENTALS OF ARCHITECTURAL DESIGN: A Textbook for Beginning College Students and a Ready Reference for Architects—By William Wirt Turner, M.S. in Arch., Author of "Essentials of Mechanical Drawings." New York and London: McGraw-Hill Book Co., Inc. Cloth; 11x15 in.; pp. 175; many line drawings and 16 full-page halftone plates. $6.

Deals with Shades and Shadows, Perspective, Greek and Roman Classical Orders, Architectural Rendering (drafting room practice) and Architectural Lettering. Liberally illustrated with line drawings both for reference and practice and with halftone plates of competitive and other designs.

FUNDAMENTALS OF PATTERN DRAFTING for Sheet Metal Shops—Middletown, Ohio: Sheet Metal Shop Service Bureau, the Armco Distributors. Paper; 6x9 in.; pp. 32; line cuts. Free.

Reprint of articles in *Ingot Iron Shop News*, 1929, by Martin J. Raubenstraw, instructor, Sheet Metal Department, Carnegie Institute of Technology.

GOETHALS, GENIUS OF THE PANAMA CANAL—By Joseph Bucklin Bishop and Farnham Bishop. New York and London: Harper & Bros. Cloth; 7x10 in.; 11 illustrations. $5.

IRRIGATION REQUIREMENTS of the Arid and Semi-Arid Lands of the Southwest—By Samuel Fortier, Principal Irrigation Engineer, and Arthur A. Young, Assistant Irrigation Engineer, Division of Agricultural Engineering, Bureau of Public Roads. Paper; 6x9 in.; pp. 68; line cuts, tables and a folding map. 15c. from Superintendent of Documents, Washington, D. C.

LEHRE VOM KNICKEN auf Neuer Grundlage—Von Dr.-Ing. ehr. Dr. H. Zimmermann, Wirklichem Geheimen Oberbaurat, Mitglied der Preussischen Akademie der Wissenschaften Inhaber der Grashof-Denkmünze. Berlin: Wilhelm Ernst & Sohn. Paper; 7½x10½ in.; pp. 91, 20 line cuts. Bound, 12½ marks.

MECHANICS: A Textbook for Engineers—By James E. Boyd, M.S., Professor of Mechanics, the Ohio State University, Author of "Strength of Materials," "Differential Equations for Engineering Students," etc. Second Edition. New York and London: McGraw-Hill Book Co. Cloth; 6x9 in.; pp. 384; 312 line cuts. $3.50.

The second edition of this widely used text (first edition published in 1921) has been rearranged to permit omission, when desired by the teacher, of the last article of some chapters and the complete omission of other chapters. It has also been rewritten in part to include the British engineer's system for expressing force—i.e., the designation of mass in the force equation by a unit known as the geepound, or 32.174 lb. More attention is given to graphical solution of friction problems. Now problems have been added.

MEMORANDUM ON CHAINS AND OTHER LIFTING APPLIANCES—By G. S. Taylor, O.B.E., Supervising Inspector of Factories, British Home Office. 2s. from any H. M. Stationery Office; 55c. from British Library of Information, 551 Fifth Ave., New York City.

PRECHLORINATION of Water Supplies—Papers by Wellington Donaldson, of Fuller & McClintock, Consulting Engineers, New York City, and John J. Quinn, Chief Chemist, Knoxville (Tenn.) Filtration Plant. Technical Publication 132, Wallace & Tiernan Co., Inc., Newark, N. J.; Paper; 6x9 in.; pp. 18. Free.

Mr. Donaldson's paper is reprinted from Municipal Index, 1930. The paper by Mr. Quinn was read before the Kentucky-Tennessee Section, American Water Works Association, January, 1930.

PROCEEDINGS of Ukraine Committee on Protection of Water Supplies from Industrial Wastes. No. 1 [Printed in Russian.] Odessa, U.S.S.R. Paper; 7x10 in.; pp. 96; line cuts.

Contains eleven articles on the biological and chemical studies of various industrial wastes as well as experimental studies of their treatment.

RECENT TRENDS in American Municipal Government—Edited by Clarence E. Ridley, Editor *Public Management*. Chicago: International City Managers' Association, 923 East 60th St. Paper; 6x9 in.; pp. 38. $1.

A ten-author symposium. Three of the topics are: The City as a Municipal Corporation, by William B. Munro, Professor of Municipal Government, Harvard University; the Growth of Municipal Functions, by Lent D. Upson, Director, Detroit Bureau of Government Research, Inc.; the Government of Metropolitan Areas, by Thomas H. Reed, Professor of Political Science, University of Michigan.

ROAD TRAFFIC CENSUS, 1928: Report, Including Tables of Statistics of Traffic Recorded on Class I Roads in Great Britain at the General Census taken in August, 1928, and at the Special Census taken during 1928-29, together with Diagrams, Charts and Maps. London: H. M. Stationery Office. Paper; 8x13 in.; pp. 42. May be obtained for 65c. from British Library, 551 Fifth Ave., New York City.

SCIENCE AND THE SCIENTIFIC MIND—By Leo F. Saidla, Assistant Professor of English, Polytechnic Institute of Brooklyn, and Warren E. Gibbs, Instructor in English, Columbia University, and Lecturer in English, Polytechnic Institute of Brooklyn. New York and London: McGraw-Hill Book Co., Inc. Cloth; 6x9 in. $3.

A STUDY OF SLIP LINES, STRAIN LINES AND CRACKS IN METALS UNDER REPEATED STRESS—By Herbert F. Moore, Research Professor of Engineering Materials, and Tibor Ver, Assistant Professor (Adjunct) in the University of Technical Sciences, Budapest, Hungary. Urbana, Ill.: Engineering Experiment Station. Paper; 6x9 in.; pp. 62; line cuts, tables and many halftones. 35c.

TABLE FOR USE IN COMPUTING ARCS, CHORDS AND VERSINES—By Harry Clow Bordman, Chicago Bridge & Iron Works. The Author, 1305 West 105th St., Chicago. Paper; 5x7 in.; pp. 32. $1.

Prepared by an engineer oppressed by the tedium of solving many structural problems, for use with the squares and logarithms of Inskip and Smoley. It has a range from 0 to 60 deg.

TENSION TESTS OF RIVETS—By Wilbur M. Wilson, Research Professor of Structural Engineering, and William A. Oliver, Instructor in Civil Engineering. Urbana, Ill.: Engineering Experiment Station. Paper; 6x9 in.; pp. 38; halftones, line cuts, and tables. 25c.

TESTS OF COMPOSITE BEAMS AND SLABS OF HOLLOW TILE AND CONCRETE—By D. E. Parsons and A. H. Stang, U. S. Bureau of Standards. Paper; 6x9 in.; pp. 34; halftones, line cuts and tables. 15c. from Superintendent of Documents, Washington, D. C.

WELD DESIGN AND PRODUCTION: With Particular Application to Safety and Cost—By Ronert E. Kinkead, Consulting Engineer. New York: The Ronald Press Co. Cloth; 6x9 in.; pp. 108; line cuts and halftones. $4.

A discussion from the standpoint of safety and cost. Written from the point of view of using welding in "repetitive manufacturing processes," but contains some information on weld behavior and procedure that may be useful to the structural engineer.

Letters to the Editor

Why the Pin?

Sir—Why does the civil engineer wear his society pin or badge? One never sees a lawyer, doctor or architect wearing a pin or badge marking him as such, and for that matter one seldom sees a butcher, baker or candlestick maker ticketing himself as such. Even the great British Institution of Civil Engineers, after which our American Society of Civil Engineers is supposed to be patterned, has, as I understand it, never had a badge or a pin.

The sixtieth convention of the American Society of Civil Engineers recently held at Cleveland was notable in one respect, in that the addresses of both President Coleman and Dr. Wickenden touched at great length on the old question of lack of appreciation on the part of the general public of the capacity and standing of the engineer, particularly the civil engineer. This topic of the ingratitude of the world to the civil engineer's capacity is one that comes up in almost every gathering of the profession. There is always some bitterness as to why a lawyer, a doctor or an architect has more public recognition than the civil engineer. It seems fundamental to me that the civil engineer will never get the public recognition that he deserves nor attain the professional standing comparable to that of a lawyer, a doctor or an architect until he changes his whole point of view and gets over his inferiority complex.

Until the civil engineer can throw away the society pin I do not think there is much hope for improving public recognition or his professional standing. Someone on the board of directors of the society should offer a resolution to the effect that the society pin be done away with and that it become an offense against the ethics of the profession to wear the pin. I know many employers who, if they had to hire a civil engineer for a position of responsibility involving contacts with the business world and had in front of them three candidates of apparently equal capacity professionally, two of whom were wearing the society pin, would, other things being equal, employ the third man who did not wear the pin. If the society pin were something like the Phi Beta Kappa pin there might be some excuse for it, but merely to pay dues to as large a society as the American Society of Civil Engineers and then wear the pin and wear it with the hope that it will improve one's professional standing is, it seems to me, an expression of weakness which the business world, and particularly the employing business world, balks at. TRAVELER.

Chicago, Ill.,
Aug. 10, 1930.

Solving Cubic and Quartic Equations

Sir—I have read with interest Mr. Llewellyn's article on "Solving Cubic and Quartic Equations" in your issue of Aug. 14, p. 254. As a result of studies which I have had occasion to make I reached the conclusion that methods such as those described in the above article, though beautiful, necessitate many subsidiary operations which in themselves are far from simple and furnish to the computer frequent opportunities to make errors.

The numerical solution of an equation of any degree may be accomplished with absolute accuracy by Horner's method, in which the individual steps are of the utmost simplicity. Once this method is grasped there is no more real difficulty with an equation of the tenth degree than with one of the third; and any objection on the score of "groping" would apply with equal force to the everyday rule for long division.

Horner's method was first published in "Philosophical Transactions of the Royal Society of London" in 1819. In principle it is the same as the method proposed by Vieta in the sixteenth century, though vastly superior thereto in procedure. The subject is fully treated in "Theory and Solution of Algebraical Equations," by J. R. Young, professor of mathematics, Royal College, Belfast (1835).

R. C. STRACHAN,
Consulting Engineer.

New York, N. Y.,
Aug. 16, 1930.

* * *

Sir—I have read with interest the article by F. T. Lewellyn, "Solving Cubic and Quartic Equations." During my own structural experience I have encountered a number of cubic equations as well as two or three quartics and have employed a method which I believe to be simpler and more direct than that of the author. In engineering problems the direct general method of Cardan's reduction usually results in pairs of complex terms whose evaluation would involve more time and labor than are warranted.

Instead of a formal method, I have always resorted to Horner's method of approximating the roots. The only values one is interested in being the real roots, these are readily obtained to any desired degree of accuracy, and by using synthetic division in the various steps the actual labor is small indeed. A rough graph of the equation is needed, and from this curve one can usually pick out the required root. In case two roots are close together both can be obtained. It will often take longer to construct the graph than to obtain all of the real roots by this method after the graph has been drawn. However, the construction need not take much time, as only enough points are needed to determine where the curve crosses the X axis. By obtaining the maximum and minimum points and the approximate intercepts on the axes, the curve can be roughly sketched in and the desired roots obtained quickly by synthetic division.

DONALD PATTERSON,
Structural Engineer.

Harrisburg, Pa.,
Aug. 30, 1930.

News of the Week

Contract Awarded for Railroad to Boulder Dam Site

With a bid of $115,000 the Merritt-Chapman & Scott Corp., of New York City, has obtained the contract for grading, trestle and culvert construction work on the 22-mile spur line from Take-off Point, near Las Vegas, Nev., to Summit, the proposed government construction camp near the Boulder dam site. The successful bid was the lowest of nineteen submitted.

The work, to be started at both ends simultaneously, is to be completed by Dec. 26. All material will be furnished by the Union Pacific Railroad, which will follow the grading closely with a track-laying crew. The track is expected to be ready for operation in six months.

The spur line construction, under the contract, calls for 375,000 cu.yd. of excavating, 36 pile trestles, six frame trestles and 62 corrugated iron culverts. A crew of about 200 men will be employed, while the railroad will have an equal number in the track-laying gang.

Upon completion of the spur line, the government will build an additional seven miles of railway from Summit to the dam site.

Reduced Appraisals for Bonnet Carré Spillway Land Approved

Judge Borah, of the U. S. district court, has confirmed awards by the new appraisal commission on two of the largest tracts of land in the Bonnet Carré spillway area over which the government and owners have been in controversy for many months.

On the tract owned by William J. Guste and Alvin Johnson, the award recommended by the commission was $97,456.50 for the 1,949 acres of land, approximately $50 per acre. The old commission, which was dissolved by the court some time ago, had recommended the payment of $256,000 for the same tract.

In the case of the tract of 900 acres owned by Mrs. Florentine Kugler, the court approved and confirmed the recommendation of the commission for the payment of $153,981.31, or $150 per acre, whereas the old commission had recommended the payment of $208,000 for the same tract.

The owners have intimated that they will appeal.

Union Offers $1,000 Reward for Arkansas Bridge Wreckers

The International Association of Bridge, Structural and Ornamental Iron Workers, through P. J. Morrin, president, St. Louis, Mo., has offered $1,000 reward for the conviction of the persons responsible for dynamiting the Arkansas state toll bridge at Garland City, Ark., on Sept. 3. The explosion did about $200,000 damage. One of the two theories advanced for the vandalism was labor trouble. The other that the dynamite had been placed by residents of the vicinity as a result of difficulties with the state highway department.

Commenting on the press dispatches from Garland City, President Morrin said: "I myself and the officers of the International Association resent this reflection upon union labor or upon structural steel workers, as we are wholeheartedly opposed to sabotage."

The Kansas City Bridge Co., which constructed the bridge on the open-shop basis, denied having any labor difficulties.

Hurley Shaping Flood-Control Policies

Convinced There Should Be Closer Co-ordination of Various Agencies and Longer Terms of Assignment for Army Engineers

By Richard Saunders
Washington Office, Engineering News-Record

On board U.S.S. "Mississippi" on the Mississippi River.

As Secretary of War Hurley nears New Orleans on his inspection trip down the river from St. Paul, some definite policies regarding flood control and navigation are beginning to shape themselves in his mind. If the river is to be subdued, the government must approach the work with its forces fully organized, he believes. There must be a closer co-ordination of the various agencies doing the work so that the program can be executed in a balanced manner. This is policy No. 1. The government has spent $200,000,000 so far on navigation improvement and flood-control work. Many more millions will be spent.

Already, Gen. Lytle Brown, Chief of Engineers, and Gen. T. Q. Ashburn, head of the Inland Waterways Corporation, have worked out a plan for keeping the river open to navigation during future low-water periods. There always has been close co-operation between the Corps of Engineers, which supervises the dredging of the river, and the Inland Waterways Corporation, but it has been difficult at times for each to realize the problems of the other.

Must Maintain Channel

One point agreed upon is that the district engineers will be instructed to give first consideration to the maintenance of the channel no matter what other work may be going on. The construction of wing dams and hurdles tends to restrict the channel before the spring rises set in. Dredges will be kept on hand, therefore, to keep the channel open. One point, known as Moro Island, 40 miles below St. Louis, was passed where barge traffic had been tied up for several weeks. A hurdle was constructed in the early spring to constrict the channel and to force the river to cut through a bar on the other bank. The expected rise did not come, however, and the traffic had to wait until a dredge could be brought down. Under the new arrangement, the dredges will be kept on the spot until it appears that the constriction works will have the desired effect.

It is also announced that the dredges and snag boats will be brought out earlier in the season in years when it seems that low-water trouble will be experienced. In most of the places where hurdles have been constructed out from the shore it has been observed that they are having the desired effect in building up the banks and thus constricting the channel.

Longer Terms for Engineers

Another conviction to which Mr. Hurley has come is that the army engineers directing the work should be kept at their posts until the tasks to which they were assigned have been completed. At present the engineer officers are assigned to a different post every four years. It has frequently happened that a district engineer has been shifted just as he was beginning to make real progress on his river work.

The trip thus far has thoroughly convinced Mr. Hurley that the government cannot cope with the Mississippi if it continues to send down a new batch of engineers every four years. During the stopover at St. Louis the people of the Missouri Valley were promised that Col. George Spaulding, division engineer of the Upper Mississippi Valley Division, will be kept at his station until the work of improving the upper Missouri has been carried further toward completion.

The advisability of decentralizing the work from Washington also has been impressed on the secretary. It is in keeping of the new policy of longer assignments that the engineers in the field should be allowed greater opportunity of exercising their own judgments, he stated. He has called attention to the emphasis placed by President

Hoover on the necessity of decentralizing the rivers and harbors work and the flood-control work.

Although no announcement has been made, it is believed that the way is being paved toward the application of the longer assignment policy to the office of the Chief of Engineers. It is pointed out in this connection that General Brown will not be subject to retirement under the age ruling at the end of four years. It is a rigid army regulation that all officers must be retired from active duty when they are 64.

No Decision on Change in Plans

No decisions are being made during the trip as to the adoption of changes to the flood-control plan. Secretary Hurley has made aerial inspection trips over the Boeuf and Atchafalaya basins. The existing project calls for the diversion of 900,000 sec.-ft. down the Boeuf basin and 1,500,000 down the Atchafalaya. After flying over these sections, the secretary stated that there is more land under cultivation and more money invested in drainage work in this area than he had supposed.

Mr. Hurley has promised that after he returns to Washington he will go over all of the material he has accumulated and to make a decision as to whether or not he will recommend changes in the Jadwin plan. The most contested feature of the plan is in connection with the Boeuf and Atchafalaya diversions. He has indicated that the land in the path of the Boeuf diversion is worth more protection than it is accorded in the Jadwin plan.

At Helena, Harry Jacobs, chief engineer for the State of Louisiana, came aboard the vessel to submit the Louisiana flood-control plan. This plan eliminates the Boeuf spillway by providing for reservoirs in the Arkansas and White rivers. Secretary Hurley stated that the Louisiana plan seems reasonable but that the opinion of the army engineers is that it does not provide for 300,000 sec.-ft. in the maximum flood height to be expected—in other words, that the Louisiana plan has a discrepancy of 300,000 sec.-ft. at maximum flood height.

Mr. Jacobs has been requested to give his plans further consideration and either to account for the discrepancy or to report that he is certain that the army engineers are in error. After he has made a restudy of his plans, he will again submit them to the secretary and will then receive a definite answer as to whether or not the proposed changes will be adopted. It is estimated that the Louisiana plan would cost $800,000,000 to complete.

Bowles, Detroit Recalled Mayor, Defeated for Re-election

The special mayoralty election in Detroit on Sept. 9, held to choose a successor to Charles Bowles, who had been recalled, resulted in the choice of Frank Murphy, who received 106,637 votes. Bowles ran second, with 93,985 votes. George Engel was third.

Another State Highway Engineer for Louisiana

W. H. Norckauer has been renamed state highway engineer for Louisiana, displacing H. B. Henderlite, who succeeded him on Sept. 20, 1929. Mr. Norckauer has been with the Louisiana highway department for twenty years. In 27 months under the administration of Gov. Huey P. Long, Louisiana has had six changes in the office of state highway engineer. Those holding that office since May 21, 1928, in order are: James M. Fourmy, Max Cunningham, L. R. Ames, W. H. Norckauer, H. B. Henderlite and W. H. Norckauer.

Co-operation in Development of Tennessee River Asked

Pursuant to the project for the development of the main stream of the Tennessee River adopted as part of the rivers and harbors act of July 3, 1930, Major Lewis H. Watkins, in charge of the U. S. Engineer office at Chattanooga, Tenn., has addressed a letter to state, county and municipal officials, power companies and other interested bodies in the region affected asking for notification of any proposed plans for participation in the work of improvement. The program of construction approved by the Chief of Engineers calls for a 9-ft. waterway secured by a series of low dams, but provides for the alternative construction of high dams to serve the combined interests of navigation, flood control and power production in co-operation with private interests, states or municipalities should such a course prove desirable. Information in regard to any such proposed development is requested by Major Watkins in time for inclusion in a report to be submitted to the Chief of Engineers on Nov. 15, 1930.

Sewage in River Causes $10,000 Suit Against Columbus, Ohio

Damages of $10,000 are asked from the city of Columbus, Ohio, in a suit attacking pollution of the Scioto River by sewage. Everett L. and Elva Jahn, who live 800 ft. from the river near Grove City, ask $8,000 on the ground that river pollution has made their home an unfit and unhealthful place in which to live, and $2,000 for actual damages to their house and furniture alleged to have been caused by gases from the river. The city contemplates building a new $6,000,000 sewage-reduction plant to eliminate the source of the complaints.

PROGRESS ON ARIEL DAM, WASHINGTON

This view, taken Sept. 1, 1930, shows the progress made on the Ariel dam across Lewis River in Cowlitz County, Wash., about 25 miles north of Portland, Ore. In the right foreground are sections of the constant angle arch dam abutting against bedrock on this the south bank of the river. In the left background are beginnings of two sections of the north toe of the arch abutting against a gravity section with the spillway section next to it. The section in the foreground is practically up to full height, which is El. 240. In the center, the bedrock goes down in V-shape box canyon, 110 ft. below stream level to El. —60; thus the dam at that point will be 300 ft. in height. Excavation at this point is practically completed with dragline loading into 6-yd. tractor-type trucks. About 5,000 g.p.m. of seepage water is being cleared with pumps suspended from a cable crossing the canyon. Pump capacity is available to care for 8,000 g.p.m. Concrete is now being poured into this excavation. The dam will impound 232,000 acre-ft. of usable storage with an expected maximum drawdown of 60 ft. The lake at normal elevation, 235 ft., will be about 12½ miles long and from ¼ to 1¼ miles wide. It will contain approximately 4,000 surface acres.

N. Y. Sewage Works Association Meets in Syracuse

The fall meeting of the New York State Sewage Works Association was held at the Onondaga Hotel, Syracuse, N. Y., on Sept. 13. Eighty members and guests were registered. C. A. Holmquist, president, presided and paid tribute to the memory of Kenneth Allen, founder and first president of the association. The announcement of the passing of Mr. Allen was a distinct shock to all present and a fitting resolution was adopted.

Following a brief business meeting two papers were presented, one on "Chlorine Uses at Sewage Plants," by L. H. Enslow, of the Chlorine Institute, and the other on "Stream Pollution From the Operator's Standpoint," by Prof. E. B. Phelps, of Columbia University. The discussion of the papers was respectively opened by C. R. Cox and A. F. Dappert, both of the state department of health.

At the luncheon Dr. George Ruhland, health commissioner of Syracuse, welcomed the members and gave an address on "The Relation of the Sanitary Engineer and the Health Officer in Community Health Protection."

In the afternoon an instructive inspection trip was made to the main sewage-treatment works of the city of Syracuse, the Solvay lime wastes beds, where the sludge is disposed of, and to a small plant at Eastwood, where separate sludge digestion and control were demonstrated.

After a dinner in the evening, a lively round-table discussion with Vice-President Morris Cohn presiding was held. R. S. Rankin, John F. Skinner and Harry W. Eustance led the discussion on the following topics: "Metal Preservation Above and Below Sewage Surface," "Garage Wastes" and Experience With Small Pumping Stations." A paper prepared by J. F. T. Berliner on "The Ammonia-Chlorine Treatment of Sewage" was read by Mr. West.

The next meeting of the association will be held in Albany at the time of the winter meeting of the New York State Conference of Mayors.

Final Cost of Wanaque Aqueduct $5,978,378

The final cost of the Wanaque aqueduct, $5,978,678, was presented to the North Jersey district water supply commission on September 9 by Fuller & McClintock, engineers. Compared with the estimated cost of $7,755,000, a saving of $1,164,270 was indicated. The final cost was reported in connection with a recommendation of payment to the T. A. Gillespie Co., constructor of the aqueduct, of $114,132.95, the final construction payment.

The engineers also reported that the cost of the aqueduct, the head works buildings and equipment, electrical equipment, pumping equipment, bonus to the Gillespie company and the balancing reservoir amounted to $7,142,648.

Co-operation Urged Between American and Foreign Steel Interests

Two speakers at a luncheon arranged by the American Institute of Steel Construction in honor of Otto Von Halem, director of Beratungsstelle für Stahlverwendung (advisory committee for the promotion of the steel industry in Germany), stressed the desirability of interchange of experiences and research results between all steel manufacturing and consuming countries. George E. J. Pistor, of the Hay Foundry & Iron Works, New York, treasurer of the A.I.S.C., who has just returned from a two months' tour of Europe, pointed out the advantage to the United States of a higher standard of living for labor in Europe. If Europe can develop a larger consumption of steel, less will be exported, said Mr. Pistor. Herr von Halem concurred in this belief and told of the success with which promotional efforts, instigated in 1927, are meeting in Germany. These activities are confined to home markets, according to Herr von Halem. He pointed out how the steel tonnage for office buildings, public buildings, dwellings, etc., had increased from 70,000 in 1927 to 250,000 in 1929. In addition the manufacture of ribbed metal lath, steel-tube scaffolding and welded wire mesh for road reinforcement has been introduced.

Bids Called For on Two Bridges in Montreal

The Canadian National Railways has called for bids on two bridges in connection with the Montreal terminal, to be received up to Sept. 24. The bridges cross the trackage of the railway and span all railway traffic entering the Bonaventure area. They will be of the latest type concrete and steel construction, with four lanes for vehicular traffic and ample sidewalk accommodation on each side. The Guy St. bridge will have eight spans and will be 740 ft. in length. The Mountain St. bridge will have ten spans and be 900 ft. long. The successful bidder will, it is expected, be able to start work by Oct. 1 and operations will be continued throughout the winter.

The Canadian National termianal plan, when completed, provides for the abolition of 78 grade crossings, over which it is estimated 16,500,000 vehicles pass each year.

Akron, Ohio, Not to Vote on $3,000,000 Sewer Bond Issue

The city council of Akron, Ohio, has reconsidered its recent decision to submit to the voters a proposed $3,000,000 sewer bond issue at the November election. The councilmen explained that in the face of present business depression and unemployment such an issue would stand no chance of winning approval at the polls.

New A.S.T.M. Standards Adopted

The returns of letter ballots sent to the members of the American Society for Testing Materials were canvassed on Sept. 2 and the resulting new standards and revisions of existing standards are now in effect. All of the changes cannot be listed, so only those of major importance to civil engineers are given below:

REVISIONS OF EXISTING STANDARDS

1. Billet-Steel Concrete Reinforcement Bars (A 15-14).
2. Welded and Seamless Steel Pipe (A 53-27).
3. Wrought-Iron Plates (A 42-18).
4. Welded Wrought-Iron Pipe (A 72-27).
5. Specifications and Tests for Portland Cement (C 9-26).
6. Building Brick (Made From Clay or Shale) (C 62-29).
7. Specifications and Tests for Hollow Burned Clay Load-Bearing Wall Tile. (C 34-27).
8. Specifications and Tests for Hollow Burned Clay Floor Tile. (C 57-27).
9. Structural Wood Joists, Planks, Beams, Stringers and Posts (D 245-27).

NEW STANDARDS

1. Paving Brick (C 7-29T).
2. Sand-Lime Building Brick (73-28T).
3. Specifications and Tests for Hollow Burned-Clay Fireproofing Partition and Furring Tile (C 56-28T).
4. Gravel for Bituminous Concrete Base (D 309-29T).
5. Acid-Resisting Asphalt Mastic (D 223-25T).
6. Testing Zinc-Coated Iron and Steel Wire and Wire Products (A 110-27T).
7. Test for Field Determination of Approximate Apparent Specific Gravity of Fine Aggregate (C 68-28T).
8. Test for Field Determination of Approximate Percentage of Voids in Fine Aggregate (C 69-28T).
9. Test for Field Determination of Surface Moisture in Fine Aggregate (C 70-28T).
10. Test for Distillation of Bituminous Materials Suitable for Road Treatment (D 20-28T).

New England Water Works Association Program

The 49th annual convention of the New England Water Works Association will be held in Atlantic City, N. J., Sept. 23 to 26, and an interesting program has been arranged. On Tuesday morning, Sept. 23, the Dexter Brackett medal will be awarded to Robert Andrew Cairns, city engineer of Waterbury, Conn., for his paper, "The Shepaug Tunnel." At the afternoon session the papers to be presented will be: "Disinfection of the Wanaque Aqueduct," by Attmore E. Griffin, analyst, North Jersey Water Supply Commission; "Recent Developments in Chlorination," by Francis D. West, manager of sales, Paradon Mfg. Co., Arlington, N. J.; "The Flow of Water Through Corroded Service Pipes," by Gordon M. Fair, professor of sanitary engineering, Harvard University; "How Small Cast-Iron Pipe Is Made and Used," by J. R. McWane, president McWane Cast Iron Pipe Co., Birmingham, Ala.

On Wednesday an inspection trip will be made to the plant of the U. S. Cast Iron Pipe & Foundry Co., at Burlington, N. J.

The papers to be presented on Thursday are: "The Atlantic City Water Works," by Lincoln Van Gilder, engineer and superintendent, Atlantic City;

"Copper and Health," by William G. Schneider, research department, Copper and Brass Research Association, New York City; "Modern Aspects of Color Removal," by A. S. Behrman, chemical director, R. H. Kean, research chemical engineer, and H. Gustafson, chemist, all of the International Filter Co., Chicago; "A New Development in Wrought-Iron Pipe Manufacture," by James Aston, consulting metallurgist, A. M. Byers Co., Pittsburgh; "The Submarine Pipe Line Between Portland, Me., and Great Diamond Island," by Harry U. Fuller, chief engineer, Portland Water District, Portland, Me.; "The General Water-Supply Situation of Northern New Jersey," by Morris G. Sherrerd, chief engineer, State Water Policy Commission, Newark, N. J.; "The New Wanaque Water Supply," by Arthur H. Pratt, consulting engineer, Newark, N. J.; "Methods Attempted for Prevention of Phenol and Other Tastes in Water Supply at Rahway, N. J.," by Mortimer M. Gibbons, water-works chemist, Rahway, N. J.

The result of the election of officers will be announced on Friday.

George B. Sowers Heads Cleveland Engineering Department

George B. Sowers, formerly assistant to Robert Hoffman, has been appointed to succeed him as commissioner and chief engineer of the division of engineering and construction, department of public service, at Cleveland, Ohio. Mr. Hoffman, after 23 years of service as head of the city engineering department, has been appointed consulting engineer to the city manager, a new position created to make it possible to turn the more arduous work of the city engineer's office over to Mr. Sowers.

Mr. Sowers is a native of Ohio, studied at Ohio Wesleyan and Case School of Applied Science, from which he was graduated as a civil engineer in 1913. His service with the city of Cleveland began in 1918 as an assistant engineer in the subdivision of sewage disposal. Before the year was out he had been appointed senior assistant city engineer in charge of sewer design and head of the city drafting department. In 1920 he was appointed assistant to Mr. Hoffman and in 1922 became his deputy commissioner.

Aircraft Plant in Quebec Completed

The formal opening of the completed plant of Fairchild Aircraft, Ltd., at Longueuil, Que., consisting of the factory, the airdrome and seaplane base, took place on Sept. 5. The factory, which has an area of 38,000 sq.ft., has a capacity for turning out 150 planes a year. Four runways, 1,900 ft. long and 200 ft. wide, permit a plane to take off or land under any wind conditions. The seaplane base is well sheltered by a low island.

Moisseiff New Head of Structural Welding Committee

Leon S. Moisseiff, consulting engineer, New York City, has been selected to serve as chairman of the structural steel welding committee of the American Welding Society, a post made vacant by the recent death of James H. Edwards, of the American Bridge Co. Mr. Moisseiff is a well-known bridge engineer. Of recent years he has been engineer of design of the Philadelphia-Camden bridge, consulting engineer on the Ambassador bridge between Detroit and Windsor, and the Maumee River bridge at Toledo, Ohio. He is advisory engineer to the Port of New York Authority on the Hudson River and Kill van Kull bridges, is on the board of consulting engineers of the Golden Gate bridge, San Francisco, and is consulting engineer to the Commissariat of Transportation, U.S.S.R. He is also a consulting engineer to the Chicago World's Fair Exposition, 1933.

Bids Opened for Manhattan Approach to Hudson Bridge

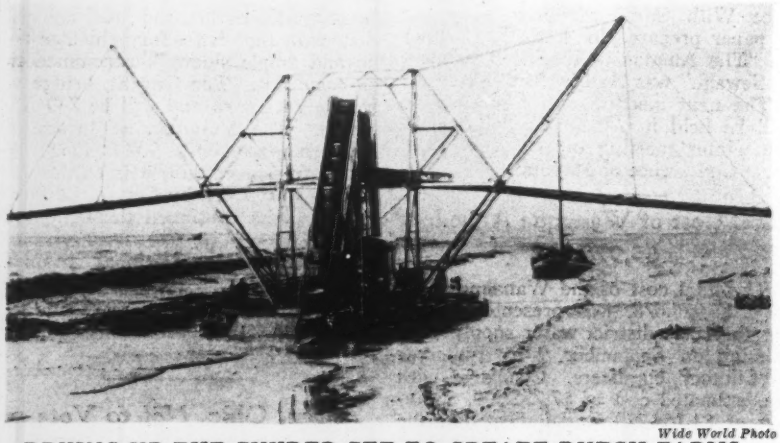
Twelve proposals for the construction of the Riverside Drive connections of the Manhattan approach to the Hudson River bridge were opened by the Port of New York Authority on Sept. 15. The bids ranged from $995,969 to $1,497,740. The Riverside Drive connections will extend from West 178th St. and Haven Ave. to a point approximately 200 ft. south of West 168th St. at Riverside Drive. They will comprise roadways making connections with Riverside Drive at three points and effecting separation of onbound and offbound bridge traffic. The work involves excavation; filling; concrete, granite, and rubble masonry construction; paving for the roadways; and the reconstruction of sewers, water mains and other utilities. Completion will be required by Oct. 1, 1931.

The bids were as follows: William P. McGarry Co., Brooklyn, $995,969; Leonard Paving Co., $1,062,656; George Colon Construction Co., $1,082,159; La Rocco Construction Corp., $1,140,913; Cornell Contracting Corp., $1,144,149; Cianciulli Corp., $1,146,705; P. T. Cox Construction Co., $1,233,864.10; W. H. Gahagan, Inc., Brooklyn, $1,296,108.20; Arthur McMullen Co., $1,340,393.50; J. F. Murphy Contracting Co., $1,360,390; Poirier & McLane Corp., $1,395,045; Triest Contracting Corp., $1,497,747.

Bond Issue for Missouri Power and Light Plant Declared Legal

The Missouri supreme court on Sept. 11 issued a writ of mandamus to compel State Auditor L. D. Thompson to register an issue of $150,000 bonds voted by Sikeston, Mo., April 1, 1930, for a municipal light and power plant. Justice E. S. Gantt in a decision, which is concurred in by the court en banc, held that the bonds had been legally voted by the people.

Auditor Thompson had questioned the issue on the ground that the poll books showed a total of 1,886 voters registered, while the returns made by the election judges stated only 1,756 votes had been cast on the bond proposition, 1,240 for and 517 against. Judge Gantt holds that the number of votes actually cast on the proposition shall govern whether the bond issue had carried and that the bonds are legal because more than two-thirds of those who voted approved the proposition.



Wide World Photo

DRYING UP THE ZUYDER ZEE TO CREATE DUTCH FARMS

Drainage of the Zuyder Zee has reached the stage where the bed is now visible. Two pumping stations were used in the drainage, drawing off a total of 125,000,000 cu.ft. of water daily from the historic Dutch sea, a part of which has been diked in. This is an area of 49,420 acres lying in the northwest corner just inside the Island of Wieringen. The area is expected to be dry by October. A little more than 27 square miles of new land, most of it of the same rich, heavy clay as the adjacent province of North Holland, will then have been won back from the sea. The illustration shows a ladder dredge opening up drainage ditches on the project.

Freak Wind and Rain Storm Injures Hillsborough County, Fla.

Practically every piece of road building and repairing machinery and equipment owned by Hillsborough County was concentrated last week in the southeastern part of the county, where early on the morning of Sept. 9 a freak storm laid waste an area of approximately 100 square miles. During a period of two hours 1½ in. of rain fell upon an already watersoaked region. The storm tore up and washed away many miles of paved road, bridges were washed out, abutments of other bridges were undermined, railroad tracks were torn up, and dozens of truck and berry farms were devastated. No loss of life was reported.

A peculiarity of the storm is that in the western part of the area deluged by the cloudburst no wind accompanied the rain, while 5 miles to the east the wind was strong enough to uproot trees.

Service on the Seaboard Air Line's Bradenton and Palm Beach branches was interrupted for 24 hours.

Actual Highway Study Arranged for Road Congress Delegates

Three hundred invitations have been issued to official and other delegates of more than 60 countries to the Sixth International Road Congress to participate in the highway inspection tours sponsored by the Highway Education Board, following the sessions of the congress from Oct. 6 to 11. The tours have been arranged to afford the delegates participating an opportunity to acquire first-hand information on the construction, maintenance and use of all types of modern highways in the United States.

The delegates invited will be divided into groups of the same size for each tour. The first tour will be devoted to a study of high-type, heavy-traffic roads in densely populated industrial areas, including metropolitan area developments. The second tour will include a thorough study of all types of roads, principally in agricultural areas and in temperate and semi-tropical zones. Special attention will be given to the utilization of low-cost roads in the semi-tropical part of the country. The third tour will be devoted to all types of roads under varying topographical and climatic conditions, with particular reference to winter conditions of frost and snow and low-cost roads in northern latitudes.

Conference to Allocate Rio Grande Water

On Sept. 19 a conference will be held in El Paso, Tex., between representatives of the states of Colorado, New Mexico and Texas to adopt rules to control distribution of the waters of the Rio Grande among those three states. Colorado will be represented by M. C. Hinderlider, state engineer; Texas by Richard F. Burgess; and New Mexico by Herbert Yeo, state engineer.

The Business Outlook

The marked lull in business activity at the end of August and the beginning of September has been followed by a general freshening of business sentiment as signs of seasonal improvement accumulate. Lengthened plant holidays and deferred check payments in the fortnight including Labor Day dropped our index to 83.5 per cent of normal despite evidence that business recovery, beginning as usual with the basic industries and primary distribution, is proceeding normally in response to seasonal stimulus. Coal and electric power production are increasing, steel output is being maintained, car loadings are rising. Expansion of commercial loans and currency circulation indicates a rising volume of wholesale and retail trade as the fall buying movement gets under way.

—The Business Week, Sept. 17.

Cook County Starts Paving Chicago Streets

In accordance with provisions of the Illinois gas tax law Cook County may pave with its share of the tax city streets which are extensions of state aid routes. These routes must be acceptable to the state and when paved the state maintains them. The county, however, does the paving. The first Chicago street to be so paved is 95th St. from Yates Ave. to Cottage Grove Ave. Construction started Sept. 15 after much delay.

The event is considered of importance in Chicago because of the apparent reluctance of the state to approve routing and of the city to accept outside jurisdiction. The state is restricted by certain definite requirements of the law as to continuity in giving its approval of routing to the county. It has also set up certain rules, mainly to insure sufficient width for parking between curbs outside of the future county-built and state-maintained roadway.

The city, on the other hand, is not anxious to give up any jurisdiction of its streets to outside officials. For one thing, for all future cutting of the pavements it requires a $500 bond for each cut. Another underlying cause for reluctance on the city's part to accept pavement contribution in kind rather than money is because the contract prices for slab built by the county run approximately one-half those usually bid for city paving. Labor, contractors and material interests in consequence view the invasion askance. On the other hand, chambers of commerce, improvement associations and citizens along the route who will be relieved of special assessment burdens (all paving in Chicago is charged against abutting property) approve of the change.

Brief News

PLANS FOR A NEW SANITARY PLANT to provide a sewage-disposal system for the people in the newly annexed territory in southeast Memphis are being made by Memphis city engineers.

COPIES of the 39 proposed charter amendments have been mailed to the 49,797 qualified voters within the city limits of Dallas, Tex., as required by law. These amendments, which will be voted on Oct. 10, provide for the council-manager form of government.

BIDS ARE BEING ASKED by the Vancouver, British Columbia, Town Planning Commission for the Burrard St. bridge over False Creek inlet, which is estimated to cost $3,500,000. The bridge will provide direct access to the Point Grey section of the city and on a lower deck will carry Canadian Pacific Railway tracks and street railway tracks.

PLANS FOR A TOLL BRIDGE across the Schuylkill River at Sixth St., Reading, Pa., have been approved by the War Department. The bridge will be constructed by the Reading Bridge & Warehouse Co., a subsidiary of the Federal Bridge Co., of New York.

THE BOARD OF FINANCE of the city of Paterson, N. J., has taken the final step calling for the floating of a $10,000,000 bond issue preparatory to taking over its share of the holdings of the Passaic Consolidated Water Co., which will be used to distribute the waters of the Wanaque reservoir to the residents of that city.

THE NEW $700,000 state-owned toll bridge across the White River at Newport, Ark., was dedicated on Sept. 10. The steelwork of the bridge, which is 2,900 ft. long, was built by the Missouri Valley Bridge & Iron Co., and List & Weatherly were contractors for the concrete work.

AUTOMOBILE TRAFFIC will again be possible on a number of highways in the vicinity of Montreal and Quebec next winter, it is announced by J. E. Perrault, minister of highways. In view of the good results attained last winter, he says, he has decided to adopt this year the same policy and at least 200 miles of highway will be kept in such condition as to allow motor vehicles to operate without difficulty.

MORE THAN 100 NEW CONTRACTS for highway construction in Queens County, New York City, at an estimated cost of $1,300,000 will be awarded before the close of the year. Since Jan. 1 of this year, 212 contracts calling for the payment by the city of $1,200,000 have been let.

FOURTEEN MILES of public highway on Mount Desert Island, off the coast of Maine, will be built by John D. Rockefeller, Jr., at a cost of $4,000,000. The project will employ 500 men for three years. Mr. Rockefeller has already built approximately 40 miles of public motor and carriage roads on the island.

New Welland Ship Canal Opened to Downward Traffic

On Sept. 10 the first vessel to traverse the new Welland Ship Canal, the "Georgian," of the Northwest Transportation Co. fleet, was locked through the three twin-flight locks at Merritton and Thorold. The passage of the "Georgian" marked the opening of the use of the canal for eastbound traffic only.

WASHINGTON NOTES

By Paul Wooton
Washington Correspondent

Little Delay Expected in Drafting Treaty for St. Lawrence Waterway—Potomac River Park Near Reality

SO AUSPICIOUS have been recent developments regarding the St. Lawrence seaway that the appointment of commissioners by the United States and Canada to set about drafting a treaty covering the provisions of the project in detail is expected to follow with little further delay. Premier Bennett's government not only is in a position to go forward but has committed itself definitely to actually undertaking the plan.

In reply to the State Department's note of Sept. 2 suggesting that negotiations be resumed without further delay, Premier Bennett stated that he would be ready to go into the matter immediately upon his return in November from the Imperial Economic Conference, which opens Sept. 30 in London. R. J. Manion, new minister of railways and canals, has announced his intention to press the project with all possible speed. This announcement was well received in Canada, as the people generally believe that he was appointed to that portfolio for the specific purpose of starting work on the waterway. It is reported in Washington that opposition in the dominion has evaporated. As the root of such opposition in the provinces of Ontario and Quebec was largely political, no further obstruction is expected in that quarter.

The most intricate problem before the treaty commissioners will be the division of costs between the two countries. This doubtless will require long and painstaking deliberation, but is not regarded as an insurmountable obstacle to negotiation of the treaty. With respect to the allocation of power, it is stated on good authority here that international law requires a 50-50 division between the United States and Canada.

Move to Acquire Park Lands

Under the terms of the Cramton bill, which became a law during the last session of Congress, the federal government, in co-operation with the District of Columbia and the states of Maryland and Virginia, has undertaken to construct a park along both sides of the Potomac between Great Falls and Mount Vernon. It is expected that means will be devised at a meeting of the National Park and Planning Commission to be held on Sept. 19 to set the financial machinery in motion to buy some of the necessary land. The second deficiency bill, passed last session, made available $1,000,000 for the work.

The states of Maryland and Virginia, any of the local bodies in these states, or any other agency is required to match the federal government in its appropriation for this work on a 50-50 basis. The Maryland National Capital Park and Planning Commission is understood to have funds available which can be used for the park development. At the coming meeting it is believed that a plan can be worked out for starting actual purchases on the Maryland side. Officials of the National Capital Park and Planning Commission expect that an agreement also will be worked out with Virginia authorities in the near future.

To complete the parkway development an expenditure of $3,000,000 each will be required of Virginia and Maryland and to match this amount the federal government will have to put up $6,000,000 more. In addition a sum in excess of several millions of dollars will be necessary to take care of the park development along the section of the river bordering on the District of Columbia.

Despite the recommendations of the army engineers in charge of the Washington district that a harmonious plan can be worked out for beautification of the gorge of the Potomac and for power development in the area, Congress decided to suspend all power survey permits for the present time. This does not mean that the door is definitely closed to power developments in the gorge of the Potomac. The matter is closed for the time being, however, and it will be up to future sessions of Congress to decide whether or not power dams can be constructed in the sections of the Potomac Valley set aside for parks.

Society Calendar

AMERICAN INSTITUTE OF STEEL CONSTRUCTION, New York City; Pinehurst, N. C., Oct. 27-28.

AMERICAN IRON & STEEL INSTITUTE, New York City; semi-annual meeting, New York City, Oct. 24.

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York; fall meeting, St. Louis, Mo., Oct. 1-3.

AMERICAN WELDING SOCIETY, New York; fall meeting, Chicago, Sept. 22-27.

ASPHALT PAVING CONFERENCE, New York City; ninth annual conference, Memphis, Tenn., Dec. 1-5.

INTERNATIONAL ROAD CONGRESS; Washington, D. C., Oct. 6-11.

NATIONAL SAFETY CONGRESS, Chicago; annual meeting, Pittsburgh, Pa., Sept. 29-Oct. 3.

NEW ENGLAND WATER WORKS ASSOCIATION, Boston, Mass., annual convention, Atlantic City, N. J., Sept. 23-26.

ENGINEERS CLUB of Charlotte, N. C., has established a $500 loan fund to aid worthy boys at the Charlotte technical high school who are interested in engineering courses. The club will also bring a number of the leading scientists of the country to Charlotte for lectures at the high school.

NATIONAL COUNCIL OF STATE BOARDS OF ENGINEERING EXAMINERS will hold its eleventh annual convention in Richmond, Va., Oct. 20 and 21.

Personal Notes

C. M. Hughes, of Kirksville, Mo., secretary of the Missouri state highway commission since 1927, has resigned and E. C. Cramer, former secretary of the Chamber of Commerce of Brookfield, Mo., has been named to fill the vacancy.

W. F. Summers has been appointed manager of the branch office recently established in Boston by the H. K. Ferguson Co., of Cleveland.

James L. Ferebee, superintendent of public works, West Allis, Wis., has been made chief engineer of the Milwaukee Metropolitan Sewerage Commission, succeeding Robert Cramer. The latter is retained in a consulting capacity along with T. Chalkley Hatton, formerly chief engineer.

Charles Brown Cornell has taken up his duties as construction engineer on the $3,500,000 Prettyboy dam, to be constructed by the city of Baltimore. He came from Youngstown, Ohio, where he was engineer on the Mahoning Valley sanitary district dam. The Prettyboy dam and a 20 billion gallon reservoir are to be completed in about two years. Bids will be asked in the near future.

Obituary

H. T. Lotter, federal highway engineer in charge of Missouri, died at his home in Jefferson City, Mo., on Sept. 9. Mr. Lotter was a native of Missouri and was graduated from the state university.

Jackson Morrow, 81 years old, for years surveyor of Howard County, Indiana, civil engineer and former police commissioner at Kokomo, Ind., died at the home of his son recently. Mr. Morrow was a graduate of the University of Michigan.

Clyde Brannon, a civil engineer with the New York City board of transportation since 1925, died on Sept. 11. Mr. Brannon, who was a native of Fremont, Neb., was graduated from the engineering school of Harvard University. He was a construction engineer in the New York state highway department from 1922 to 1925.

Percy E. Hart, chief engineer of the Toronto Hydro-Electric System, died at his home in Toronto on Sept. 10 after a brief illness. Mr. Hart, who was born in Plymouth, England, 60 years ago, went to Canada when he was a small boy and engaged as construction engineer with the Canadian General Electric Co., then with the Edison General Electric Co. He had held his position with the Toronto system since 1913 and had been in charge of practically the entire physical part of the system, handling construction work involving more than $25,000,000. Mr. Hart was a fellow of the American Institute of Engineers and also of the Canadian Institute of Engineers.

Construction Equipment and Materials

Concrete Pavement Yardage

There is given below a tabulation of concrete pavement yardage awarded during the month of August, 1930, and also the total number of square yards awarded for roads, streets and alleys in the United States for the year 1930 to date as of Aug. 30:

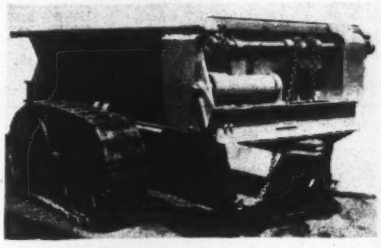
	Sq.Yd. Awarded During Aug. 1930	Sq.Yd. Awarded From Jan. 1, 1930 to Aug.30,1930
Roads	7,242,839	84,954,327
Streets	3,194,120	24,154,834
Alleys	220,009	1,784,141
Totals ..	10,656,968	110,893,302

New Developments

Spring Wind-Up Closes Doors on Large Dump Wagons

Not feeling satisfied with the complicated mechanism in power devices recently developed for winding up the doors of large dump wagons, the Western Wheeled Scraper Co., of Aurora, Ill., has developed a simple and easily operated door control for Western crawler wagons which can be attached to units in the field as well as to new wagons in the shop. The spring wind-up is the result of many months of work in striving for a simple, foolproof device. It is a new departure in door-control mechanism, operating through the two most economical forms of power — gravity and spring action. The spring acts instantly to close the doors and in its entire design the mechanism meets the need for simplicity, speed, safety and economy.

The mechanism in brief is as follows: a large spring with sufficient initial energy to close the doors tight under

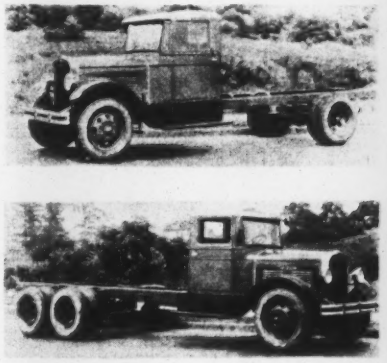


SPRING CLOSES DUMPING DOORS

all conditions; a toggle-and-ratchet arrangement, completely inclosed, to hold the doors closed against a load and to open them against the spring pressure; and a pawl-and-ratchet device so constructed that a single pull on a rope running to the tractor or on the lever to which the rope is attached will trip the load and a second pull on the same rope or lever will close the doors when the wagon has moved forward free of the dumped load. As this mechanism is controlled at all times by either the tractor driver or the man on the dump, it eliminates the man formerly needed to trip and wind up the doors, as well as increases production by its greater speed. No extra attachments are needed for the tractor.

New Truck Series Includes Six-Wheel Model

Eleven models of Day-Elder trucks ranging in capacities from 1 to 12 tons are now being produced by the National Motors Manufacturing Co., Irvington, N. J. In this series particular stress has been placed on outer design and appearance, specifications including chromium-plated fixtures and inclosed cabs of the all-weather type. Typical of the four-wheel trucks is model 160,



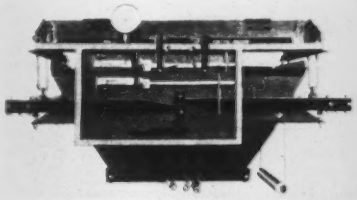
3-AND 8-TON TRUCK MODELS

illustrated, which is rated at 3 tons with a total allowable weight of 16,000 lb. for chassis, cab, body and load. This truck is powered with a Continental six-cylinder engine of the overhead type with seven-bearing crankshaft which develops 81½ hp. at 2,400 r.p.m. The four-speed transmission is of the selective type, with a multiple disk, dry-plate clutch. A Timken worm-drive, full-floating rear axle is used. Service brakes, of the Lockheed hydraulic internal expanding type, operate on four wheels, with an emergency brake on the propeller shaft. Semi-elliptic springs are used, with a helper spring mounted on the rear. The frames are of semi-flexible deep section pressed steel. This model is available in wheelbases of 156 and 165 in. as standard, with special lengths of 180 and 204 in. available.

Six-wheel trucks are furnished in 8-, 10- and 12-ton capacities, utilizing the Timken four-wheel drive unit. Model 285, rated at 8 tons, is driven by a six-cylinder Continental motor developing 100 hp. at 2,600 r.p.m. The wheelbase for this unit is 164 in. standard, with a 204-in. length available. Other construction details are similar to those already described.

Weighing Device for Aggregates

A new weighing AggreMeter designed to meet specifications of the American Association of State Highway Officials is announced by the Erie Steel Construction Co., Erie, Pa. This AggreMeter can be attached to practically any type of bin and is made in sizes to accommodate 1-, 1½-, 2- and 3-



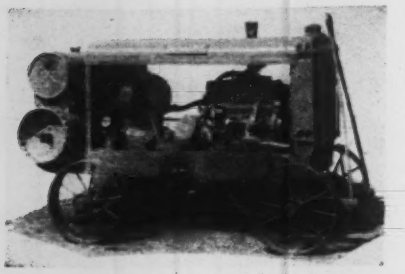
TWO-COMPARTMENT WEIGHING AGGREMETER

cu.yd. mixers. The gates of the unit are of the clamshell type, requiring very little headroom. To open, a crank is turned one-quarter revolution; release of the crank permits the gate to close itself. Scales are of the charging type, with a beam for each material or size, equipped with an auxiliary dial which shows only the approach to the desired weight. All knife edges are properly hardened and ground and have very little movement, resulting in long life. A beam cover box which can be locked to protect the scales is regular equipment. Material is contained in a self-cleaning welded material box. Excess material can be removed from any side. The draw-off doors of the box close automatically. When closed, a positive catch locks the doors, making it impossible to open them until the trip rope is pulled. Ball-bearing pulleys are used to assure easy and positive action of the counterweight.

Small Compressor Unit Patterned After Larger Sizes

Contractors requiring a small gasoline-driven air compressor unit will be interested in the model 72 Schramm portable compressor developed by Schramm, Inc., West Chester, Pa., which embodies features found in the larger outfits of the same company. These include a clutch which permits starting the engine independently of the compressor, an automatic cutout or slow-down which reduces the speed of the engine when the compressor is unloaded, a heavy-duty tractor-type Buda engine, a hot-riveted A.S.M.E. code tank, and a one-piece cast-steel frame. The machine has a piston displacement of 72 cu.ft. per minute and is driven by

a four-cylinder motor equipped with force-feed lubrication, high-tension magneto and Stromberg carburetor. Both motor and compressor are water cooled, circulation being forced by a centrifugal



72-CU.FT. AIR COMPRESSOR UNIT

pump through a radiator of single-core design. Cooling water is never driven from the motor into the compressor without first passing through the radiator. The outfit is completely housed with removable steel doors and is spring mounted on rubber-tired wheels.

Revolving Tunnel Shovel Mounted on Crawler Treads

Ease in handling and speed in loading with the Nordberg-Butler tunnel shovel, originally designed by the Nordberg Mfg. Co., Milwaukee, Wis., for operation on rails, has been increased by a newly developed crawler mounting which eliminates the time lost in laying track. The crawlers are of all-steel construction, with treads of a special alloy. Each one is driven by a separate four-cylinder air motor, so arranged that either tread can be run in either direction independently of the other. This permits turning the shovel in an 8-ft. circle. At the front of the unit is a wide shoe which takes the downward strain from the dipper when digging. When moving the unit, this shoe is raised by means of a ratchet lever operating screws, but normally this is not necessary, as the shoe can easily be pushed over or through such loose material as may be lying on the bottom. The shovel, as is the case with the rail mounted model, operates on compressed air. All movements of the dipper from crowd to dumping are controlled by a direct-acting thrust cylinder. The revolving action is controlled by a four-cylinder air motor of the same type as is used for the crawlers. As the machine is full revolving, it will load into cars from either side or directly in back. It will operate in a drift 6 ft. in width at the dipper height and 8 ft. in over-all height. Its weight, complete with crawler, is 7,500 lb.

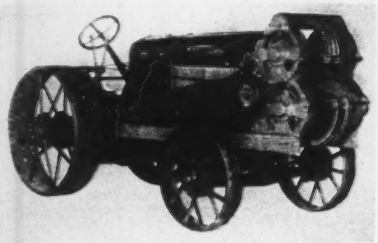
CRAWLER-MOUNTED UNDERGROUND SHOVEL

New Arc-Welding Wire Developed

A low-priced general purpose arc-welding rod, known as Wilson Red Processed arc-welding wire, has been announced by the Wilson Welder & Metals Co. Inc., North Bergen, N. J. This wire combines a fast and smooth flowing quality with good penetration. The manufacturer states that it will produce a weld of at least 50,000 lb. per square inch tensile strength, and especially recommends it for general welding operations where medium ductility is required.

Tractor-Mounted Hoist Unit for Heavy Service

Designed for mounting on the 15-30 McCormick-Deering tractor, the model HM hoist of the Trackson Co., Milwaukee, Wis., is essentially a heavy-duty machine, built for general all-around hoisting under hard, continuous service. It can be purchased either as a separate machine or mounted as a complete unit on the tractor. Installation is a simple matter, since there are no holes to bore and no construction changes to make. The hoist is mounted by means of 6-in. steel channels which extend from the front of the tractor back to and around the rear housing. The hoisting unit can be obtained in either single- or double-drum type, and can readily be converted from one form to the other by mounting or dismounting the upper drum.



DOUBLE-DRUM HOIST MOUNTED ON TRACTOR

An unusual feature is the Trackson level wind, or fairlead, which prevents the cable from crisscrossing or bunching up as it is wound onto the drum. This device works at all speeds and is easily adjusted to handle different sizes of cable. In connection with it there is an anti-backlash device which maintains proper tension and keeps the cable securely wrapped, even when the line becomes slack.

New Publications

Explosives—Recent bulletins of E. I. DU PONT DE NEMOURS & Co., Wilmington, Del., discuss high-speed tunneling methods and give, in tabular form, recommendations for the proper selection of explosives for various uses.

Diesel Engines—Construction features of vertical four cycle air-injection diesel engines constructed by the WORTHINGTON PUMP & MACHINERY CORP., New York City are described in great detail in a 44-p. bulletin S-500.

Water and Sewage Treatment—Recent bulletins of the PARADON MFG. CO., Arlington, N. J., describe the impulse type dry-feed diffusor and the Paradon ammoniator.

Welding—Directions for welding Armco ingot iron are given in a 40-p. illustrated bulletin of the AMERICAN ROLLING MILL CO., Middletown, Ohio. Illustrations are included showing notable uses of this material, fabricated by the welding process.

Paving—Facts and figures in regard to street paving in principal American cities have been compiled by THE ASPHALT INSTITUTE, 801 Second Ave., New York, N. Y., in a 16-p. illustrated bulletin.

Valves and Castings—Recent publications of the MICHIGAN VALVE & FOUNDRY Co., Detroit, Mich., describe the Michigan screw lift valve and Meehanite, a new form of iron for valves and castings with unusual strength, toughness and resistance to abrasion.

Material Handling — Belt conveyors, bucket loaders, ditchers and coal and snow loaders are among the many pieces of equipment described in a new 32-p. catalog of the BARBER-GREENE CO., Aurora, Ill., which describes the entire line of material-handling machinery produced by this company.

Pumps — Centrifugal pumps especially adapted to sewage disposal and water supply for municipalities are described in bulletin 16 of the CHICAGO PUMP CO., Chicago, Ill., entitled "Chicago Pumps for Municipalities." Other recent publications of this company include an 8-p. pamphlet illustrating certain popular pump models and a folder on the Condo-Vac vacuum pump.

Material-Handling Equipment—Two recent publications of the GEORGE HAISS MFG. CO., INC., New York City, describe equipment for handling loose material. The first of these, catalog 230, describes all products of the company, including screens, elevators, conveyors, gates, chutes, buckets, belt conveyors and the Haiss excavator. It contains 80 pages and many illustrations. A separate publication, bulletin 530, contains 18 pages illustrating and describing the excavator and giving details of a number of jobs upon which this machine was used.

Costs and Contracts

E. N.-R. Index Numbers

Cost			Volume	
Sept. 1, 1930	199.58	August, 1930		250
Aug. 1, 1930	200.95	July, 1930		226
Sept. 1, 1929	207.57	August, 1929		290
Average, 1929	207.02	Average, 1929		317
Average, 1928	208.78	Average, 1928		287
1913	100.00	1913		100

This Week's Contracts

Heavy construction contracts, reported by *Engineering News-Record* in the week of Sept. 18, with some comparisons, total as follows:

(In Thousands of Dollars)

	Sept. 18, 1930	Average of Last Four Weeks 1930	1929
Buildings:			
Industrial	$3,052	$4,600	$5,825
Other	23,899	20,992	30,954
Streets and roads..	11,004	10,629	13,494
Other eng. constr..	27,214	16,651	18,417
Total	$65,169	$52,873	$68,691

Total, all classes, Jan. 1 to Sept. 18:

1930	$2,523,826
1929	3,113,263

Unit Prices From Current Construction Bids

Substructure for Waldo-Hancock Suspension Bridge at Bucksport, Me.

THE Waldo-Hancock highway bridge will cross the Penobscot River near Bucksport, Me. It consists of an 800-ft. suspension span with 350-ft. side spans flanked at either end by continuous through plate-girder viaducts on steel columns. Bids for the substructure were received July 29, 1930, and the contract was awarded on the lowest, $282,712. The two main piers account for 75 per cent of the bid, these piers being the only substructure work in the river and in 40 ft. of water in a rapid current.

The formations encountered in all borings on both land and water were so coarse and compact and contained so many boulders that the casings could be advanced only by core drilling and usually only after dynamiting the boulders, which ranged 3 to 3½ ft. in diameter. Formation at the west river pier is rock overlain with a foot or two of silt; at the east pier it is chiefly boulders mixed with clay and gravel. River piers 7 and 8 will be constructed by the open cofferdam method, sealing the bases with concrete placed under water. At bed, the caisson is sealed with grade B concrete and the cofferdam is removed. These two piers are faced with granite.

Concrete is of two grades: A, 1:5½ mix, minimum 6.16 bags cement per cubic yard; maximum, 6 gal. water per bag cement; compressive strength, 1,750 lb. at seven days, and 3,000 lb. at 28 days. B, 1:6 mix, 5.64 bags, 6½ gal. water, 1,600 and 2,800 lb. Ratio of fine to coarse aggregate is not less than one-half or more than one. The slump test limit is 1 to 3 in. for foundations and piers. Minimum mixing time is 1¼ minutes.

Concrete is placed under water only as specified for sealing the bottoms of the caissons, cylinders or cofferdams and for this concrete the cement content is increased 25 per cent and amounts to not less than seven bags per cubic yard. To insure continuous placing under water, duplicate concrete mixing and handling equipment must be maintained at each pier.

Eight lump sum bids were received, the lowest being 9 per cent below the second and 21 per cent below the average. Unit prices to be used for adjustment in case of additions or deduction of quantities of materials are given of the lowest two bidders, both of New York: A. Merritt-Chapman & Scott, 17 Battery Place; B, Frederick Snare Corp. Robinson & Steinman, 117 Liberty Street, New York, are consulting engineers.

	A	B
2,270 cu.yd. conc. in water at piers 7 & 8	$24.00	$50.00
3,730 cu.yd. conc. in dry at piers 7 & 8	29.00	14.25
1,540 cu.yd. rubble and (or) cyclopean conc. in anchors	13.00	13.00
1,700 cu.yd. other conc. in anchors	15.00	15.00
375 cu.yd. conc. in piers 1-2-3-5-6-9-10	15.00	15.50
520 cu.yd. conc. in abutment	18.00	19.00
108 lin.ft. conc. railing abut.	5.00	17.00
139,000 lb. reinf. steel	.06	.055
394 cu.yd. granite facing on piers 7 & 8	82.00	84.00
188 cu.yd. rock ex. for main pier No. 8	15.00	26.00
475 cu.yd. rock ex. for west anchorage	4.00	4.15
10 cu.yd. rock ex. for west abutment	7.00	4.15
1,220 cu.yd. earth ex. for main piers 7 & 8	2.00	4.20
3,400 cu.yd. earth ex. for anchors	.90	1.05
430 cu.yd. earth ex. for abutments & land piers	1.20	1.40
2,300 cu.yd. fill in and around anchorages	.50	1.00
1,850 cu.yd. fill in both approaches	.50	.70
13,950 sq.ft. waterproofing abut. and piers 7 & 8	.05	.11
2 steel doors in abut.	75.00	76.00
116,000 lb. placing anchorage steel	.015	.021
4 acres clearing and grubbing	150.00	693.00
46 cu.yd. asphalt around cables and anchorage	50.00	66.50
	$282,711.50	$300,187.25

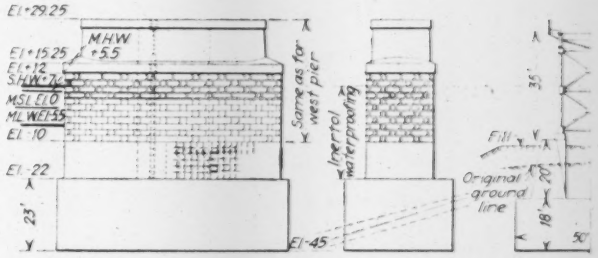


FIG. 2—ELEVATIONS EAST MAIN PIER 7 AND HALF CROSS-SECTION AT ANCHOR BENT 4

Base of pier is 34½x72½ ft. by 23 ft. high; pier rises 51½ ft. above top of base. West pier 8 is same as pier 7 above El. —10; base is 26½x72½ ft. by average 22 ft. high; pier above top of base, 39¼ ft. Steelwork for anchor bent 4 is same as for bents 1, 2 and 3, and typical for the other bents, which are higher.

Monroe St. Sewer, Chicago

West Monroe St. sewer in Chicago consists of 32,535 lin.ft. of sizes varying from 9½x12-ft. to 4½-ft. concrete to 2- to 5-ft. brick and ⅜- to 3-ft. vitrified tile. Three bids were received July 24, 1930, and contract was awarded on the lowest, $2,046,975, submitted by the Underground Construction Co., 130 North Twelfth St., Chicago. Unit prices are given of this contractor and of the two others, who were: B, White Construction Co., $2,078,985; C, Michael Pontarelli, $2,130,661.

Concrete	Cut in Feet	A	B	C
5,700 ft. 9½x12-ft. horseshoe	18	$81.00	$83.00	$100.00
2,680 ft. 9x11-ft. horseshoe	16	73.00	78.00	88.00
2,680 ft. 8-ft.	14	46.00	46.00	40.00
475 ft. 6-ft.	14	26.00	27.00	25.00
810 ft. 4-ft.	10	17.00	16.00	16.00
Brick				
400 ft. 4½-ft.		30.00	34.00	23.00
740 ft. 2-ft.		13.00	16.00	11.00
Tile				
250 ft. 1½-ft.		6.00	6.00	4.00
700 ft. 1-ft.		4.50	5.00	3.00
100 ft. 5/6-ft.		3.00	4.00	2.50
120 manholes		90.00	90.00	80.00
80 catchbasins		75.00	80.00	80.00
15,000 cu.yd. conc. foundation, class B		10.90	10.00	12.00
65,000 sq.yd. 3½-in. sheet asphalt top		2.70	2.40	3.00
12,000 sq.yd. granite block pavement		6.20	6.00	6.00
25,000 sq.yd. brick pavement		4.00	4.00	4.00
200 sq.yd. creosoted wood block pavement		4.00	4.00	5.00
10,000 cu.yd. macadam		3.00	3.25	3.00
150 cu.yd. high-early-strength conc.		20.00	20.00	15.00
20,000 lin.ft. conc. combined curb and gutter		1.50	1.45	1.25
7,000 lin.ft. conc. vertical curb		1.15	1.10	1.00
20,000 sq.ft. cement walk		.35	.40	.30
3,000 sq.ft. cement driveway		.65	.75	.60
5,000 cu.yd. cinders		2.00	2.00	1.00
50 M ft.b.m. oak planking		150.00	175.00	75.00
1,100 cu.yd. sand fill		2.50	3.00	2.00
95,000 cu.yd. surplus excavation removed		1.60	1.70	1.25

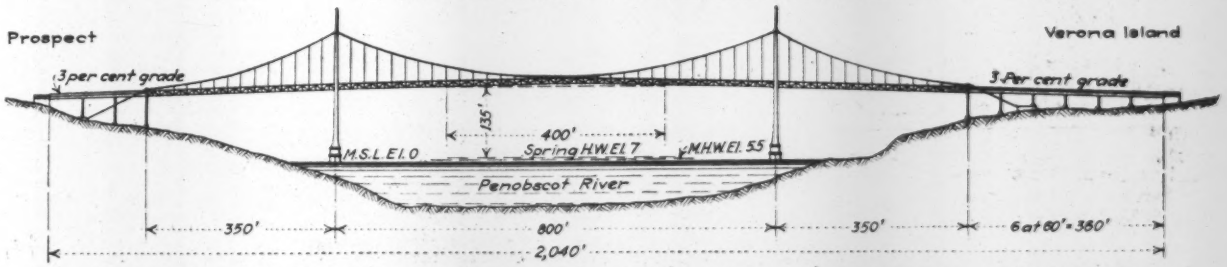


FIG. 1—PROFILE OF WALDO-HANCOCK BRIDGE OVER THE PENOBSCOT RIVER NEAR BUCKSPORT, ME.

Unit Prices From Current Construction Bids

Surfacing With Stone and Oil, Washington State

SURFACING with crushed stone and oiling in place of 31.4 miles (18 ft. 2 in. with 4-ft. shoulders) of road 3, Chewelah to Kettle Falls Park, Stevens and Ferry counties, Wash., cost $1,715 per mile. Lowest two bidders were Diesel Oil Sales Co., Seattle, $53,938; Arthur E. Velguth, Spokane, $54,415. Their prices were: 12,300 cu.yd. stone in place (from stockpiles), $0.40 and $0.50; preparation of roadway per mile, $125 and $150; 10,070 bbl. No. 2 oil in place, $2.95; mixing and finishing per mile, $490 and $425.

Stone-Filled Pile Bulkhead in Cleveland

A STONE-FILLED wood pile bulkhead is being constructed at Kirtland Station, East 49th Street and Lake Front, Cleveland, Ohio, for the department of public utilities. The bulkhead is 3,602 ft. long and the contract price is $98 per linear foot. There are four types of construction, as shown in Figs. 1 and 2: B, 3,152 lin. ft.; C, 90 ft.; D, 170 ft.; E, 40 ft.; F, 50 ft.; located as shown in Fig. 1. Type B is the principal construction, C, D and E being used around the intake as shown at the right in Fig. 2, while F is used only to connect the bulkhead with the shore as shown at the extreme left in Fig. 1.

Type B bulkhead consists of a double row of wood piling filled with stone and capped with much larger stone, as shown at left in Fig. 2. Piles are driven on 3-ft. centers in the front or lake row and on 2-ft. centers in the rear or land row, and cut off at El. 572, leaving 45 ft. in place. Wales are Douglas fir. Upper wales, scabbed, are bolted with 1½-in. wrought-iron bolts to every other pile, in both front and rear rows. Lower wales are placed on the lake bottom. Upper and lower wales each have 1½-in. tie-rods on 6-ft. centers. Crossbeams are 12x12's on 12-ft. centers. The 3-in. horizontal sheeting is forced into the bottom as far as possible. Fill to El. 571 is "container-car stone" of 25-lb. minimum. Capping stone is 5 to 8 tons.

Type C bulkhead is constructed the same as type B except that sheeting is omitted and stone fill is riprap of 500 lb. to 2 tons.

Type D is a single row of 88 piles per 100 lin.ft., with wales on both sides at the top bolted to every pile. Piles are cut off at El. 578.4, leaving 55 ft. in place.

Type E, between bulkhead and intake, is of rubble mound construction, the 3- to 8-ton stones being lowered in place by derrick.

Type F is a single row of piles backed with vertical sheeting and anchored with 45-ft. batter piles on 9-ft. centers driven at a 20-deg. angle, the top being 40 ft. back from the bulkhead piles and at El. 575. The batter piles are tied to the bulkhead with 1½-in. rods.

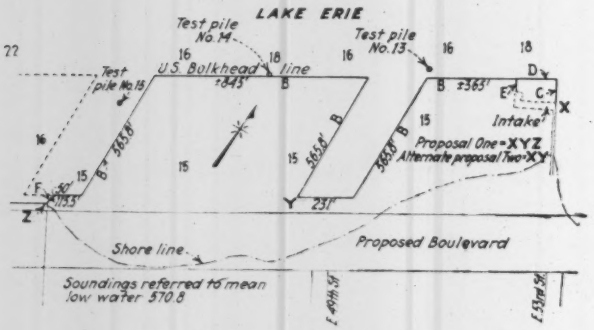


FIG. 1—LOCATION OF KIRTLAND STATION BULKHEAD, CLEVELAND

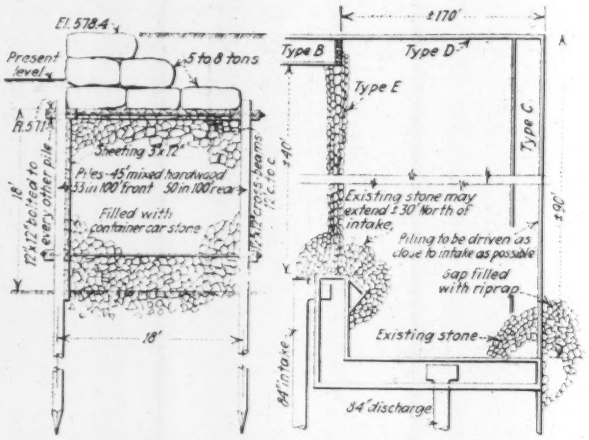


FIG. 2—(LEFT) CROSS-SECTION OF TYPE B BULKHEAD; (RIGHT) DETAIL OF MUNICIPAL LIGHT PLANT INTAKE

Bids were received June 27, 1930, from four contractors, and the contract was awarded to the lowest bidder for $352,328, which was 4 per cent below the second, 6 per cent below the third and 20 per cent below the fourth. Work started at once and time of completion, estimated by the contractor, is 100 days, compared with 150 to 180 days estimated by the other bidders. Unit prices are given for the lowest two bidders, both of Cleveland: A, C. H. Strong & Son and L. A. Wells Construction Co., 30 Euclid Arcade; B, American Construction Co. L. A. Quayle is chief engineer of the department of public utilities.

		A	B
TYPE B—Totals, $321,440.09 and $335,308			
45 ft. piles	121,625 ft.	0.48	0.48
Upper wales	130,080 ft.	0.135	0.115
Lower	65,040 ft.	0.135	0.125
Crossbeams	48,780 ft.	0.135	0.115
Horizontal sheeting	175,608 ft.	0.095	0.125
1½-in. rods, bolts, nuts, washers	195,120 lb.	0.08	0.05½
Container car stone	59,707 ton	2.49	2.73
Capping stone	17,561 ton	2.80	3.02
TYPE C—Totals, 8,945.33 and 9,150			
45 ft. piles	3,366 ft.	0.48	0.48
Upper wales	3,600 ft.	0.135	0.115
Lower wales	1,800 ft.	0.135	0.125
Cross beams	1,350 ft.	0.135	0.115
1½ in. rods, bolts, nuts, washers	5,400 lb.	0.08	0.05½
Riprap	1,652 ton	2.80	3.02
Capping stone	486 ton	2.80	3.02
TYPE D—Totals, 4,794.00 and 4,352			
55 ft. piles	7,650 ft.	0.52	0.49
B.M. wales	4,080 ft.	0.15	0.115
1½ in. bolts, nuts, washers	2,550 lb.	0.08	0.05½
TYPE E—Totals, 5,102 and 5,502			
Riprap (3 to 8 ton)	1,822 ton	2.80	3.02
TYPE F—Totals, 2,002 and 1,837			
45 ft. piles	1,250 ft.	0.50	0.48
Wales and sleepers	1,900 ft.	0.13	0.115
Vertical splined sheeting	8,400 ft.	0.125	0.115
1½ in. rods, bolts, nuts and washers	1,000 lb.	0.08	0.05½
MOORING AND FENDER PILES—Totals, 10,044.80 and 11,688			
60-ft. piles	14,400 ft.	0.65	0.78
Wales	3,600 ft.	0.18	0.12
Bolts, nuts and washers	460 lb.	0.08	0.05½
Totals		352,327.82	367,837.38
Days to complete		100 days	170 days
MISCELLANEOUS			
Per hour for use of derrick scow		30.00 (10 ton)	40.00 (30 ton)
Per hour for use of piledriver		25.00 (10,000 lb.)	30.00 (5,000 lb.)
Per lin.ft. test pile driven and pulled		1.00	1.00
Per lin.ft. 50-ft. piles in place		0.50	0.55
Per lin.ft. 55-ft. piles in place		0.52	0.60
Per lin.ft. 60-ft. piles in place		0.54	0.65

CONSTRUCTION NEWS

Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue.

Location	Project	Cost	Status
Waterworks			
Seattle	Pipe line and reservoir	$2,650,000	Bids asked
Bridges			
Massachusetts	Bridges	4,000,000	Contracts
St. Louis	Bridge approaches	3,250,000	Proposed
Excav., Dredging			
Brownwood (Tex.)	Irrigation	2,500,000	Proposed
Railways			
Ontario	Raising tracks, etc.	1,250,000	Proposed
Subways			
Philadelphia	Subway	3,692,635	Contract
Mills and Factories			
Camden (N. J.)	Factory	1,000,000	Bids asked
Buildings			
New York	Apartments and stores	2,000,000	Contract
New York	Hotel and apartments	3,000,000	Separate contracts
New York	Office	2,000,000	Separate contracts
New York	Office	50 story	Contract
Los Angeles	Office	1,250,000	Contract
Billerica (Mass.)	House of Correction	1,000,000	Proposed
Beaumont (Tex.)	Court house	1,000,000	Contract
Toronto (Ont.)	Exhibition	1,000,000	Proposed
Toronto	Exhibition (stable)	1,000,000	Proposed
Chicago	University	1,500,000	Contract
Quincy (Ill.)	High school	1,350,000	Bids asked
Cambridge (Mass.)	University	2,000,000	Proposed
Davenport (Iowa)	Theatre and apartment	2,000,000	Bids asked
St. Louis	Merchandising mart	5,000,000	Bids asked
Philadelphia	Garage	2,000,000	Proposed

WATERWORKS

PROPOSED WORK

Arkansas — Municipal Telephone & Utilities Co., Pioneer Trust Bldg., Kansas City, Mo., preliminary plans extending mains from Walnut Ridge, to Hoxie, installing distribution system at Hoxie and filtration plant at Walnut Ridge. Private plans.

Calif., San Jose—Dam in Alum Rock Park at Cherry Flats. $50,000. W. Popp, city engr.

Calif., Walnut Creek—California Water Serv. Co., Federal Reserve Bank Bldg., San Francisco, surveys 14 mi. 12 in. pipe line from Galindo pump station near Chenery reservoir through Walnut Creek to Mt. Diablo Country Club.

Idaho, Kellogg—Kellogg Power & Water Co., c/o W. G. Johnson, mgr., 2 mi. 14 in. pipe line. $50,000.

Ill., Wilmette — Pumping plant, filtration plant, new water supply from Evanston, other expansions. Election Nov. 4, $500,000, for same. Pearse, Greeley & Hansen, 6 North Michigan Ave., Chicago, engrs. Noted Apr. 10.

Kan., Whitewater — Preliminary plans complete waterworks and distribution lines, sewerage system. E. T. Archer & Co., New England Bldg., Kansas City, Mo., engrs.

Mass., Framingham—Town, relaying, extending mains, incl. some equipment. $20,000 appropriated. S. Dyer, Town Hall, engr.

Mass., Medfield—Commonwealth of Massachusetts, State House, Boston, water supply system, at State Hospital. $30,000-$40,000. J. J. Van Valkenburgh, Irving St., Framingham, engr.

Mass., Newton — Altering, constructing extensions to waterworks, incl. building, pipe, Watertown St. near Edinboro Rd., surface drains, Jackson Rd. $15,000 or more.

Mich., Midland—City doubling capacity waterworks, incl. 4 additional filters, carbonation equipment, water main from plant to intersection of State Rd. with Ashman St. $108,000. Hoad, Decker, Shoecraft & Drury, Ann Arbor, engrs.

Mich., St. Clair—Extending mains, incl. 4,100 ft. 6 in. c.i. pipe, valves, specials. $15,000. J. C. Chamberlain, city clk.

Mo., Lamar—City filtration plant. $40,000. A. C. Moore, Joplin Natl. Bank Bldg., Joplin, engr. Noted Aug. 14.

Mont., Hot Springs—Waterworks improvements. $15,000 voted. A. L. Jaqueth, Kalispell, engr. Noted Aug. 8.

N. D., Williston — City water purification plant. $75,000. Burns & McDonnell Eng. Co., 400 Interstate Bldg., Kansas City, Mo., engrs.

Okla., Hominy—Preliminary plans new drilled well supply. $20,000. A. Blackburn, city clk. Engineer not selected.

Tex., Ft. Worth—City, c/o O. E. Carr, brick, rein.-con. filtration plant addition. $450,000 incl. equipment. Hawley, Freese & Nichols, Capps Bldg., engrs.

Tex., Graham — City, c/o A. B. Eddleman, mayor, preliminary plans new settling basins for waterworks. $20,000. Hawley, Freese & Nichols, 417 Capps Bldg., Fort Worth, engrs.

Ont., Hamilton—For 6 in., and up, c.i. watermains in Mountainville Ave., Burlington St. E., and East 15th St. $100,676. W. L. McFaul, city engr.

Ont., St. Thomas—Enlarging filtration plant, incl. 3 m.g.p.d. rapid sand type filter. $95,000. W. C. Miller, city engr. Gore, Nasmith & Storrie, Confederation Life Bldg., Toronto, consult. engrs.

BIDS ASKED

Calif., Long Beach—Sept. 23, by City Council, 90,000 ft. 4- to 12-in. Class B, c.i. pipe, 12, 14 or 16 ft. lengths.

Calif., Long Beach—City Council taking bids furnishing water meters, for Water Dpt.

Calif., Oakland—Sept. 24, by J. H. Kimball, secy. East Bay Municipal Utility Dist., 2,222 tons 4- to 16-in. c.i. pipe 195 tons 4 in., 406 tons 6 in., 404 tons 8 in. Class B-bell and spigot, or 15,000 lin.ft. Class 150-4 in., 25,000 lin.ft. Class 250-6 in., 17,000 lin.ft. Class 250-8 in. bell and spigot, 616 tons 12 in. and 437 tons 16 in. Class B bell and spigot.

La., Kenner—Oct. 15, by Water Bd., waterworks in East Jefferson Water Dist. 1, incl. 3 m.g. reservoir, 6 m.g.p.d. filter plant, head house, pumping plant buildings, mixing chambers, coagulation basins, cement concrete structure, pile found. H. A. Mentz & Co., Citizens Natl. Bank Bldg., Hammond, engrs.

Md., Baltimore—See "Contracts Awarded."

Mass., Boston—Sept. 22, by Institutions Dpt., reconstructing waterworks Long Island Hospital. $15,000.

Mass., Boston — Sept. 23, by Metropolitan Water Supply Comn., 24 School St., furnishing, installing power and light wiring, transformers, switchboard and other electrical equipment in connection with outlet works at Shaft 1, Wachusett-Coldbrook Tunnel, at West Boylston, for Commonwealth of Massachusetts, Metropolitan Dist. Water Supply Comn.

Mass., Turners Falls—Keith Paper Co., Canal St., taking bids water treatment plant. Norwood Engr. Co., North Maple St., Northampton, engrs.

Miss., Long Beach — Oct. 7, by J. A. McCormick, town clk., furnishing 350 g.p.m. centrifugal pump direct connected to an electric motor, complete with necessary fittings.

Miss., Hazelhurst—Oct. 7, by Bd. Aldermen, waterworks extensions, 1,765 lin.ft. 4 in. c.i. pipe, two 4 in. valves, eight 4 in. x 2 in. tees, five 4 in. end plugs, laying complete 3,491 ft. 4 in. c.i. pipe 100 ft. 2½ gal. pipe, fourteen ¾ in. gooseneck connections and corporation and stop cocks installed, 200 ft. ¾ gal. pipe.

N. J., Trenton — Sept. 19, by City Comn., pumping plant addition. $50,000. J. O. Hunt, 219 East Hanover St., archt.

N. Y., New York—Sept. 23, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., mains in Riverside Dr. W. and viaduct.

N. Y., St. George—Sept. 23, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Alter, Bancroft, Holland, Norwalk and Ridgewood Aves.

O., Dayton—Oct. 3, by W. W. Morehouse, dir. Water Dpt., two 1 m.g. rein.-con. water storage tanks for Mt. Auburn Dist. $40,000. Noted Aug. 7.

O., Orient—Sept. 22, by H. H. Griswold, dir. Welfare Dpt., Columbus, water softener, hot water system, filter system, chemical pump, wash water pump, at Orient Institution for Feeble Minded. $23,000. J. B. Youngblood, 9th and Oak Sts., Columbus, engr.

Wash., Seattle—Bids about Oct. 15, 11 mi. 66 and 48 in. steel pipe line from Lake Youngs to Seattle, $2,000,000: bids about Nov. 15, 120 m.g. concrete reservoir, 1st Ave. S. and Cloverdale St., $650,000. R. H. Thomson, city engr.

CONTRACTS AWARDED

Ark., Nashville—Southwestern Gas & Electric Co., Texarkana, Ark.-Tex., artificial lake, earthwork dam, purification plant, treated supply reservoir, connecting pipe lines, to L. E. Myers Co., Allen Bldg., Dallas, Tex., sub-contract, to A. B. Cupp, Nashville.

Calif., Fresno—Fresno Co. Water Dist. 1, 39,000 ft. 4- to 8-in. pipe, to Edgley Co., 800 East 61st St., Los Angeles. $42,758. Noted Aug. 7.

Calif., Whittier—To American Cast Iron Pipe Co., 412 West 6th St., Los Angeles, 5,000 ft. 4 in. pipe at $0.391 per ft., 5,000 ft. 6 in., at $0.562.

Calif., Yreka — To Pacific States Cast Iron Pipe Co., 267 Washington St., Portland, Ore., 1,420 ft. 4 in. McWain Pacific horizontal pipe at $0.576 per ft., 600 ft. 6 in. sand cast B and S Class 150 precalked pipe at $0.848, 500 ft. 8 in. c.i. pipe $1.19, 400 ft. 2 x 15 ft. $0.282.

Colo., Canon City—City Council, pipe line in Royal Gorge, west of here: to Orman Constr. Co., 435 East 1st St., Pueblo, $80,000.

Ind., Rockwell—Indiana State Sanatorium, P. Beadle, secy., steel tank on tower, to W. E. Caldwell Co., 200 East Brandeis St., Louisville, Ky., mains, pumping equipment, to R. M. Cotton Co., 1720 East 10th St., Indianapolis. Est. $15,000. Noted July 31.

Ia., Clarinda—D. W. Toyne, city engr., waterworks improvements, incl. steel tank on tower, to Pittsburgh-Des Moines Steel Co., 10th and Tuttle Sts., Des Moines, $19,861: building and structures, to Robeck & Humphreys, 408 Securities Bldg., Omaha, Neb., $45,000. Noted Aug. 14.

Md., Baltimore — Bd. Awards, mains in Frederick Ave. from Martingale Ave. to new city line and in North Ave. from Chester to Gay Sts., day labor. W. G. Rost, Municipal Bldg., water engr. Noted Aug. 21.

Mass., Boston—Metropolitan Dist. Comn., 1 Ashburton Pl., 12,230 lin.ft. 20 in. and 1,200 lin.ft. 16 in. c.i. pipe, for waterworks, in Revere, to Cenedella & Co., 68 School St., Milford. $32,742. Noted Aug. 21.

Mich., Port Huron—City, furnishing 6,600 lin.ft. 12 in., 1,296 ft. 10 in. and 816 ft. 6 in. c.i. pipe for waterworks, to Lynchburg Fdry. Co., Lynchburg, Va., $15,000.

See proposal advertising on page 108

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LEADITE

—Laying 48-in. c. i. pipe with LEADITE

—Pouring 48-in. c. i. pipe joints with LEADITE

LEADITE means Economy, Efficiency and Simplicity, for Bell and Spigot Water Main Construction—

The above statement is verified by the fact that LEADITE has been used for jointing many thousands of miles of water mains,—not alone in the United States and its possessions, but in South and Central America and numerous Overseas Countries.

The name LEADITE is symbolical with good tight joints,—and (as above stated) with Economy, Efficiency and Simplicity of installation.

The Pioneer self-caulking material for c. i. pipe.
Tested and used for over 30 years.
Saves at least 75%

THE LEADITE COMPANY
Land Title Building Philadelphia, Pa.

No Caulking

Waterworks (Continued)

Miss., Goodman—Holmes Co., 800 ft. deep well, and 75 g.p.m. turbine pump with 7½ hp. motor, to Layne Central Co., Jackson, Miss., and Chelsea Ave., Memphis, Tenn., at $3.25 per ft and $1,088 respectively; 10,000 gal. storage tank on 80 ft. tower, to W. E. Caldwell Co., 200 East Brandies St., Louisville, Ky., $2,196.

Neb., Odell—R. E. Tincher, city clk., 50,000 gal. tank on 90 ft. tower, to Omaha Steel Wks., 4802 Leavenworth St., Omaha; pipe, well, pumps, to Dobson Constr. Co., Lincoln, $23,930. Est. $25,000.

N. Y., New York—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., mains in Riverside Dr., to J. V. Timoney Constr. Co., 256 Bway., $12,625; removing and resetting manhole heads, to B. Costanzo, $1,184. Noted Aug. 21.

O., Brook Park (br. Cleveland)—Village of Bay, 13,500 ft. 6-to 8-in. c.i. mains in Brookpark Rd., to F. Hadad, 3032 West Blvd., Cleveland, $35,000. Noted Aug. 28.

O., Columbus—Franklin Co., F. D. Connally, clk., 31,375 ft. 6- to 16-in. water lines in Sewer Dist. Truro 1, to H. E. Ferguson Constr. Co., 129 Arden Rd., $47,644.

Okla., Geary—T. J. Stephenson, city clk., waterworks extensions incl. 8,600 ft. 2- to 6-in. c.i. pipe, centrifugal pumps, 250,000 gal. elevated tank, to Asplund Constr. Co., Enid, $36,740. Est. $40,000. Noted Aug. 14.

Wash., Seattle—Bd. P. Wks., mains in 35th Avenue N.E., to Argentieri & Colorassi, 1819 Weller St., $18,308. Noted Sept. 4 Daily.

Ont., Lindsay—Town, 250,000 imperial gal. steel stand pipe on concrete found., to Horton Steel Wks. Ltd., Northern Ontario Bldg., Toronto. Est. $15,000.

Ont., Lucknow—Drilling, constructing wells, to Layne Canadian Water Supply Co., Metropolitan Bldg., Toronto. Est. $15,000. Noted July 31.

SEWERS

PROPOSED WORK

Calif., San Francisco—For 895 lin.ft. 2 ft. 6 in. x 3 ft. 9 in. rein.-con. sewer, incl. 332 cu.yd. concrete, 32,000 lb. reinforcing steel, also vitr. brick invert in Army St. M. M. O'Shaughnessy, city engr.

Calif., Santa Monica—For 15- to 18-in. trunk line sewer in Colorado Ave. from 20th St. to Ocean. $25,000. H. B. Carter, city engr.

Calif., Stockton—Surveys sewers in Mormon Channel between Center and Stanislaus Sts. $25,000 or more. L. Payton, city engr.

Kan., Topeka—For 5,000 ft. 8 and 10 in. sewers in Dist. Sewer 92; also 2,000 ft. 9 ft. monolithic, precast concrete, brick and segmental block storm sewer from river to 2nd and Polk Sts. W. E. Baldry, City Hall, engr.

Kan., White Water—Sewerage system. To exceed $25,000. E. T. Archer, 619 New England Bldg., Kansas City, Mo., engrs.

Mich., Saginaw—Four 4 ft. culverts, Court St. fill to increase flow in Lake Linton. $36,000. H. H. Eymer, Saginaw, engr.

N. J., Clark—Twp. Com. plans 6 mi. sanitary sewers. $140,000. Bauer, Kling & Condert, 120 Broad St., Elizabeth, engrs. Noted July 31.

N. J., Ocean City—Bd. City Comrs., City Hall, sanitary sewers in 16th to 38th Sts. from Bay Ave. to Ocean front. $250,000 appropriated. W. H. Collissen, Jr., city engr.

N. J., Plainfield—Common Council, City Hall, preliminary plans storm water sewer from Richmond St., 180 ft. north of Watchung Ave. to County Bridge Crossing North Ave. 240 ft. northeast of Berckman St. $325,000. A. Vars, city engr.

N. J., Union — Twp. Com., Town Hall, sanitary sewers in Hawthorne Ave. $25,000. H. Kreh, Jr., Falls Bldg., twp. engr.

N. J., Ridgefield — Bd. Boro Council, Boro Hall, sewage disposal plant; $150,000.

Okla., Henryetta — Preliminary plans sanitary sewer extensions in Cregland addition. $25,000. J. T. Embree, Okmulgee, engr.

Pa., Phila.—Dpt. P. Wks., Bureau Hys., A. Murdock, dir., City Hall Annex, cancelled bids to have been opened Sept. 10, Schedule A, branch sewers, Schedule B, Pennsylvania Terminal Improvt. Contr. 11, grading, paving. Will re-advertise. Noted Sept. 4.

Pa., Phila.—Dpt. P. Wks., Bureau Eng. & Surveys, A. Murdock, dir., City Hall Annex, cancelled bids to have been opened Sept. 17, Schedule A, Upper Frankfort Creek Level Collecting Sewer; Schedule B, sluice in bank Darby Creek at County line. Will re-advertise. Noted Sept. 11.

Tex., Clayton—City complete sanitary sewerage system, incl. 60,000 lin.ft. pipe, disposal plant. $110,000. H. O. Garst, Clayton, engr.

Wash., Mount Vernon—City Council, preliminary plans sewerage system. $100,000. C. E. Dorisy, Republic Bldg., Seattle, engr.

Mich., Owosso—Sewage disposal plant, concrete interceptor sewer. $203,000. N. I. Raymond, city engr.

Mo., Sullivan—Preliminary plans sewage disposal plant, auxiliary piping. $25,000. W. A. Fuller Co., 2916 Shenandoah Ave., St. Louis, engr.

Ont., Hamilton—Soon takes bids 1.5 mi. 8 in and up vitr. tile storm sewers in Burlington St. E. $42,000. W. L. McFaul, city engr.

Ont., Toronto—Vitr. tile, concrete storm sewers in Simcoe St. $176,140. R. C. Harris, City Hall, engr.

BIDS ASKED

Ind., Gary—Sept. 26, by Bd. P. Wks., Glen Park Sewer. $90,000. W. P. Cottingham, Gary, engr. Noted Aug. 28.

Ky., Louisville—Sept. 22, by Dpt. P. Wks., City Hall, 22 project sewers 15- to 57-in. diameter. $175,000. A. A. Kreiger, City Hall, engr.

Md., Towson — Sept. 29, by Baltimore Co. Comn., excavating trenches for furnishing and laying 20,060 ft. 8- to 24-in. vitr. sewer pipe, 3,733 ft. house connections, 737 ft. brick manholes, Contr. 22-S, West Catonsville. B. L. Crozier, Court House, ch. engr.

Mass., Boston—Sept. 19, by Dpt. P. Wks., sewerage works in Hamilton St. $25,000. J. A. Rourke, comr.

Mass., Boston—Sept. 23, by Dpt. P. Wks., J. A. Rourke, comr., sewerage works in Dorchester, and Sept. 24, in Roxbury. $25,000.

Mass., Boston—Sept. 26, by Dpt. P. Wks., sewerage works in West Roxbury. $25,000. J. A. Rourke, comr.

N. J., Newton—Town Com., 115 Spring St., bids about Oct. 1, reconstructing 675,000 gal. sewage disposal plant. $100,000. T. F. Bowe, 110 William St., New York, engr. Noted Aug. 14.

N. Y., Brooklyn—Sept. 24, by H. Hesterberg, pres. Brooklyn Boro, Boro Hall, sewers in Sheffield Ave. and East 53rd St.

O., Columbus — Sept. 23, by Bd. Purchase, H. C. Cain, secy., sluice gates and appurtenances, incl. 4 circular gates 24 in. diam.; twelve 48 x 48 in., five 48 x 72 in. and five 48 x 84 in. gates. $50,000. R. H. Simpson, city engr.

O., Columbus—Sept. 23, by W. H. Duffy, dir. Service, 3 concrete tanks for control of sewer flow and partial treatment. $625,000. R. H. Simpson, City Hall, engr.

Okla., Cordell—Sept. 22, by P. Peters, city clk., outfall sewer and sewage disposal plant, incl. Imhoff tank. $39,000. F. Ford, Cordell, engr.

Okla., Tulsa—Sept. 26, by City Commissioners, F. P. Kitchen, aud., Storm Sewer Project 9-H-30, along Frisco R.R. right-of-way from Arkansas River to 4th St. $82,888. H. A. Parker, Municipal Bldg., engr.

Okla., Tulsa—Sept. 23, by Bd. City Commissioners, F. P. Kitchen, aud., Storm Sewer Project 9-H-30, along Frisco R.R. right-of-way from 4th St. to Guthrie Ave., section Cat Creek Relief storm drain. $87,195.

Tex., Memphis—Sept. 29, by Comrs. Court, Hall Co., c/o A. C. Hoffman, judge, timber pile trestle bridges, earth approaches County Rd. Job 45, Sect. 3A, Unit 1, $38,000; and on same road Unit 1, Sect. 4. A. Hasie Eng. Co., Inc., Memphis, engrs.

Wash., Foster — Miller Eng. Co., engrs., Burke Bldg., Seattle, bids about Sept. 30, water works, for Water Dist. 35. $25,000.

Wash., Seattle—Bd. P. Wks., bids about Dec. 4, Hanford Street trunk sewer extension, 5,584 lin.ft. in Charleston St. $150,000. R. H. Thomson, Seattle, engr.

Wis., Milwaukee—Sept. 26, by Sewerage Comn., three 15 m.g.p.d. centrifugal pumps, motors, accessories, for electric return sludge pumping plant. J. L. Ferebee, Milwaukee, ch. engr.

CONTRACTS AWARDED

Ala., Birmingham — City Comn., sanitary sewers on Southside, to J. J. Goddard & Son, Birmingham, $52,904.

Calif., San Francisco—S. J. Hester, secy. Bd. P. Wks., City Hall, Alemany Storm Drain, Sect. C—138,000 lin.ft. timber piling, rein.-con. sewer and vitr. clay underdrains, manholes, 16,200 lin.ft. timber piling, wood box and vitr. clay sewers, to Healy-Tibbetts Co., 64 Pine St., $128,493; Sect. D—incl. 915 lin.ft. 2 compartment 8 ft., 2 x 11 ft. monolithic concrete sewer, 350 ft. 2 ft. 6 in. x 3 ft. 8 in. rein.-con. sewer, 77,000 lin.ft. piling, to C. B. Eaton, 715 Ocean Ave., $41,970. Noted Aug. 7 and 21.

Ill., Chicago—Sanitary Dist. of Chicago, 910 South Michigan Ave., Berkeley-Hillside Intercepting Sewer, concrete, to N. D'Andrea, 2412 Ash St., and A. Yalente, 389 West 16th St., Chicago Heights, $85,550. Noted Aug. 7.

Ill., Hinsdale—Hinsdale Sanitary Dist., extending 8- to 12-in. vitr. tile sewer in Ogden Ave., to I. G. Iglehart, 166 West Jackson Blvd., Chicago.

Ia., Mt. Pleasant—Mt. Pleasant State Hospital, c/o State Bd. Control, Des Moines, sewage treatment plant for hospital group, to E. L. Royer Constr. Co., Valley Junction, $25,888.

Ia., Red Oak—For 12 blocks storm drains, to Wilson Concrete Co., Red Oak, $25,544.

Mich., Harbor Springs—City, sewers, to E. M. Scheflow, Harbor Springs and Wequetonsing. Est. $60,000.

La., New Orleans — City Council, 4,166 ft. sub-drainage system in Camp and Octavia Sts., to F. D. King, New Orleans, $26,210; 4,779 ft. in North Galvez and North St. Patrick Sts., to H. P. and J. F. Egan, New Orleans, $26,220.

Md., Baltimore—Mayor and City Council, Bd. Awards, sanitary sewers, storm drains, storm Water Contr. 140, to P. Marocco, 3700 Forest Park Ave., $16,889. Noted Aug. 28.

Mass., Boston — Dpt. P. Wks., City Hall Annex, motor driven sewerage pump for Calf Pasture Pumping Station, Dorchester, to Warren Steam Pump Co., 101 Milk St., $25,949. Noted Aug. 14.

Miss., Sanatorium—Mississippi State Sanatorium, H. Boswell, supt., sewage treatment plant, incl. pumping station, pumps, Imhoff tank, dosing tank, trickling filter, chlorinator, outfall lines to and from plant, to Harbert-Cargile Constr. Co., Birmingham, Ala., $27,296.

N. J., Linden—Common Council, City Hall, relief trunk sewer in Woods Ave., to L. DiFransesco, Westfield, $98,955.

N. Y., Malverne—See "Streets and Roads."

O., Cleveland — Bd. Comrs. Cuyahoga Co., 3,260 ft. 12- to 24-in. concrete, tile sewers, Cedar Glen Rd., to L. DiChiro, 10811 Columbia Ave., $37,263. Est. $70,502. Noted Aug. 21.

Okla., Geary — T. J. Stephenson, city clk., 18,400 ft. 6- to 12-in. vitr. clay sanitary sewer extension, disposal plant, Imhoff tank, to Ashplund Constr. Co., Enid, $34,923. Est. $37,000. Noted Aug. 14.

Pa., North East—New sewage disposal plant, to J. McCormick, Erie, $33,000.

Pa., Oil City—L. O. Boquin Co., 13 East 1st St., sewers in Cowell Avenue Extension, to G. F. Roess Sons, Oil City. Est. $25,000.

Pa., Pittsburgh—Boro of Brentwood, 2.5 mi. 8 in. terra cotta sewers, to Matthew Ott & Co., 412 Warrington Ave., $19,794. Est. $25,000.

Tex., Port Arthur—City, c/o J. W. O'Neal, constructing storm sewer on Stillwell Blvd., to Central Constr Co., Athletic Bldg., Dallas, $140,000. This corrects report published Sept. 11 issue.

Wis., Milwaukee—Sewerage Comn., structural steel for dryer house addition, at sewage disposal plant, to Worden-Allen Co., Port Washington Rd., $13,750.

Wis., Milwaukee—Dpt. P. Wks., sewers in West Oklahoma Ave., to Zimmermann & Zautmermann, 2826 State St., $1,718—extension to Juneau Avenue Sewer, to General Contractors 4728 Lisbon Ave., $13,800; row along Holton St., to Wenzel & Henoch, 5025 State St., $88,225. Grand total $103,743.

Ont., Toronto—B. S. Wemp, mayor, City Hall vitr. tile storm sewers in Cherry St., to J. H. Agnew, 20 Hurndale Ave., $25,430; 8 in. and up vitr. tile sewer in Mill and Richmond Sts., to Mitchell Contg. Co., 28 Moore Ave., $13,300 and $837 respectively. Grand total $39,567.

BRIDGES

PROPOSED WORK

Ariz., Keams Canyon—Navajo Co. timber trestles over Polacca and Oraibi washes on Hopi Indian Reservation. $25,000. K. L. Hudson, Holbrook, co. engr.

Calif., Los Angeles—Los Angeles Co. removing one 60 ft. span in existing steel girder bridge and constructing two 30 ft. rein.-con. span, abutment over Coyote Creek at Carson St. W. B. Armstrong, Los Angeles, co. bridge engr.

Calif., San Diego—First Street Bridge, 462 ft. long, 48 ft. wide, steel, with 8 in. rein.-con. slab roadway, 200 ft. center span, 3 hinged arch, north approach to be two 80 ft. deck truss spans with 20 ft. stringer span. $150,000. Allen & Rowe, 309 G St., engrs.

Kansas—See "Contracts Awarded."

Maine—State Hy. Dpt., Augusta, Cumberland and Sagadahoc Counties, towns of Brunswick and Topsham, bridge over Androscoggin River on hy. between Brunswick and Topsham, $300,000.

Mass., Waltham—City, Dpt. P. Wks., reconstructing Moody St. Bridge. $25,000. Engineer not selected.

Mich., Port Huron—City retained Waddell & Hardesty, engrs., 150 Bway., New York, to prepare plans bascule type bridge over Black River, at 7th St. $185,000.

Mo., Platte City—Platte River D.D. 1, J. A. Settle, secy., preliminary plans 2 bridges over Main Ditch and one over Smith's Fork. B. B. Hurst, Rockport, engr.

Mo., St. Louis—Bd. P. Serv., City Hall, retained C. E. Smith & Co., engrs., 1752 Railway Exch. Bldg., in connection with design and construction 5 double track elevated railroad approaches to St. Louis Municipal Bridge. $3,250,000. Noted July 10.

N. J., Rahway—Bd. Freeholders Union Co., Court House, Elizabeth, preliminary plans widening, sidewalks on bridge over Rahway River, at Lawrence St., $25,000. R. Collins, Court House, co. engr.

Okla., Forgan — State Hy. Dpt., Oklahoma City, preliminary plans 6 span 110 ft., rein.-con. bridge, near here, Beaver Co. $30,000. A. R. Losh, Capitol, Oklahoma City, engr.

Okla., Roosevelt—State Hy. Dpt., Oklahoma City, preliminary plans 1 span 80 ft. steel truss bridge on concrete piers, Kiowa Co. $40,000. A. R. Losh, hy. engr.

Tex., San Angelo—Tom Green Co. concrete, steel vehicular and pedestrian bridge over Concho River, Oakes St. $75,000. Address County Eng. Dpt., c/o J. T. Mathison, judge, San Angelo.

BIDS ASKED

California — Sept. 23, by Bd. Supervs. Alameda Co., Oakland, 2 rein.-con. bridges on over Crandall Slough between Alvarado and Centerville, $50,000. G. A. Posey, Oakland, co. surv.

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Bridges (Continued)

California—Oct. 1, by C. H. Purcell, engr. State Hy. Comn., Sacramento, fifteen 19 ft. timber spans with concrete deck, one 41 ft. 4 in. steel beam removable span bridge over Alamitos Bay near Long Beach, Los Angeles Co.

Calif., Long Beach — Oct. 1, by State Hy. Comn., Sacramento, bridge to have fifteen 19 ft. spans with concrete deck and 41 ft. 4 in. steel beam removable span over Alimatos Bay near here, Los Angeles Co. C. H. Purcell, state hy. engr.

Calif., San Rafael—Oct. 14, by R. E. Graham, clk. Marin Co., 2 rein.-con. bridges in Road Dist. 4, incl. 135 cu.yd. Class A concrete, 12,600 lb. reinforcing steel. R. Messner, co. surveyor.

Calif., Yuba—Sept. 29, by A. B. Brown, clk. Sutter Co., reconstructing portion Nicolaus Bridge, incl. center pier with 2 steel spans on each side. $45,000.

La., Tallulah—Sept. 24, by Bd. Comrs. Fifth Louisiana Levee Dist., c/o R. K. Boney, secy., steel or timber bridges over Bayou Roundaway Diversion Canal, Madison Parish. Board State Engineers 207 New Orleans Court Bldg., New Orleans, engrs.

Massachusetts—See "Contracts Awarded."

Mass., Boston—Sept. 25, by Dpt. P. Wks., J. A. Rourke, comr., repairing concrete piers, bridge over Port Channel, Summer St.

Mass., Tyngsboro—Sept. 23, by Dpt. P. Wks., Boston, 546 ft. steel arch, concrete bridge over Merrimac River; steel bridge with concrete abutments over Boston & Maine R.R., and 2 small rein.-con. bridges over Marshall's Brook, with bituminous macadam approaches. A. W. Dean, Dpt. P. Wks., Boston, engr. Noted June 26.

Michigan—Sept. 24, by C. L. Cowgill, resident engr., Plymouth, FB1 of 47-6-23, Contrs. 1 and 2, steel deck girder, 2 rein.-con. abutments, 4 mi. southeast of Brighton, Livingston Co., for State Hy. Comn., Lansing.

Missouri—Sept. 26, by State Hy. Bd., Jefferson City, bridges in Atchison, Bates, Buchanan, Dunklin, Henry, Iron, Jackson, Laclede, Lawrence, Lewis, Monroe, Montgomery, Pettis, Ralls, Ripley, Schuyler, Scott, Shannon, Stoddard, Vernon and Wayne. J. H. Cutler, ch. engr.

N. Y., Croton—Sept. 23, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, reconstructing Titicus Bridge, Croton Watershed.

Pennsylvania—See "Streets and Roads."

Pa., Pittsburgh—Sept. 19 (invitation only), by Baltimore & Ohio R.R. Co., Baltimore, Md., and Maloney Bldg., Pittsburgh. H. A. Lane, Baltimore, Md., ch. engr., A. C. Clark, Maloney Bldg., div. engr., bridge at 2nd St. $70,000.

Rhode Island—Sept. 24, by State Bd. P. Rds., Providence. State Bridge 194, Federal Aid Project 49-C, Hopkinton and Westerly — Ford Pond Bridge 264, and Shippee Brook Bridge 266, Foster—widening Branch River Bridge 108, North Smithfield; adv. E. N.-R. Sept. 18.

West Virginia — Sept. 23, by State Roads Comn., Charleston, Upper Landgraff Bridge, three 50 ft. spans, steel I-beam steel superstructure on concrete substructure, Project 2048-C, McDowell Co.—Laurel Bridge, substructure, 2 abutments, 2 piers, Project 3431—Oxbow Bridge, 2 concrete abutments, Project 3431, both Ritchie Co.—3 culverts, approaches, Project 77, Greenbrier Co. E. D. Yewell, ch. engr.

CONTRACTS AWARDED

Alabama—State Hy. Dpt., Montgomery, concrete bridges on Birmingham-Leeds Hy. and on Birmingham-Jasper Hy., Jefferson Co., to W. Howton Constr. Co., 1007 37th Pl., N., Birmingham $32,128 and $41,935 respectively. Noted Aug. 28.

Arizona—State Hy. Comn., Phoenix, widening Superior Bridge and steel bridges at Mining and Post Office Canyons, Rice-Springerville Hy., to W. Peper, 617 Heard Bldg., Phoenix, $11,687 and $18,763 respectively—surfacing Springerville-New Mexico Line Hy., to Tenney & Black, Clifton, $24,818. Grand total $55,268. Noted Aug. 14.

California — State Hy. Comn., Sacramento, overhead crossing, 2¼ mi. north of Beatrice, Humboldt Co., to F. J. Maurer & Son, Inc., Eureka, $50,320. Noted July 31.

Calif., Riverside—See "Streets and Roads."

Calif., Seal Beach — State Hy. Comn., Sacramento, seven 57 ft. span rein.-con. girder bridge on concrete pile foundations, with 60 ft. roadway, two 5 ft. sidewalks over San Gabriel River, Los Angeles Co., to J. F. Knapp, Oakland, $113,977.

Illinois—State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, bridges in Marion Co., to Mississippi Valley Structural Steel Co., Decatur, $7,658—DuPage Co., to Acme Eng. Co., 28 North Wells St., Chicago, $30,422—Fayette and Christian Counties, to Clinton Bridge Wks., Clinton, Ia., $34,440. Grand total $72,520. Noted July 3 and 24.

Ill., Chicago—City, operators houses and enclosures for double leaf trunion bascule bridge over Chicago River, at North Wabash Ave., to G. P. Cullen, 2940 West Lake St., $64,071. Noted Aug. 14.

Ind., Anderson—Madison Co., concrete arch bridge over White River, to E. F. Smith, 2050 South Harding St., Indianapolis, $86,000. Est. $138,298. Noted Sept. 4.

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Kansas—State Hy. Comn., Topeka, five 35 ft. deck girder span bridge across Big Creek in Ellis, to Schlichter Constr. Co., Clay Center, $21,144; rejected bids raising three 40 ft. span deck girder bridge and adding two 40 ft. deck girder spans on Federal Aid Project 399-C, Harvey Co.

Kentucky — State Hy. Dpt., Frankfort, toll bridge over Ohio River at Ashland substructure, to Vang Constr. Co., Grant Bldg., Pittsburgh, Pa., $141,280; superstructure, to Mt. Vernon Bridge Co., Mt. Vernon, O., $439,870. Noted Aug. 14.

Ky., Graefenburg—State Hy. Comn., Frankfort, concrete bridge over Benson Creek on Frankfort-Louisville Rd., to G. M. Eady Co., Gilbert and Lee Sts., Louisville, $27,809.

Md., Lanham—State Rds. Comn., Baltimore, substructure for 101 ft. bridge, approaches, over Pennsylvania R.R., here, Prince Georges Co., to Victor A. Pyles Co., Brooklyn, $65,308. Noted July 31.

Massachusetts — Boston & Maine R.R. Co., W. J. Backes, ch. engr., Boston, 4 bascule single lift type bridges, electric control, 60 acres filling, 21 steel, concrete caissons, lengthening passenger platforms, removing present bridges, below Cambridge St. over Charles River, Boston and Somerville, day labor and separate contracts; superstructures for above to Phoenix Bridge Co., 110 State St., Boston; sub-structures and masonry, to T. Stuart & Son, Phillips St., Watertown; electric — bridge operation for bridges, to Norwood-Noonan Co., 450 West Superior St., Chicago, Ill. Total est. $4,000,000.

Mass., Taunton—City, P. Wks. Dpt., concrete beam, slab bridge, to W. H. Barker, 4 Cohannet St. Est. $25,000.

Mass., Weston—Boston & Maine R.R. Co., W. J. Backes, ch. engr., Boston, steel railroad bridge, Fitchburg Div., separate contracts. $25,000 or more.

Michigan — H. C. Fleming, resident engr., Grand Rapids, structural steel for 2 rein.-con. abutment, steel deck girder bridge, MB2 of 41-23-11, Contr. 1, to Massillon Bridge Co., Massillon, O., $33,227; complete structure, 2 rein.-con. abutments, steel deck girder bridge, MB2 of 41-23-11, Contr. 2, to J. J. Wernette Eng. Co., Grand Rapids, $112,346, both in village of Grandeville, Kent Co., for State Hy. Comn., Lansing. Noted July 17.

Michigan—At office Chief Engineer Hy. Dpt., Lansing, MX1 of 33-10-2 Contr. 3, 2 counterfort abutments with concrete girder superstructure, Ingham Co., to J. W. Hertel, Grand Rapids, $24,009, incl. cement.

Miss., Grenada—Bd. Supervs. Grenada Co., 51 timber bridges in various locations, to Robinson & Co., Muscatine, Ia., $23,987. Noted Aug. 28.

Missouri—State Hy. Bd., Jefferson City, to M. E. Gillioz, Monett, bridges over Little Sugar Creek $25,649, over Spring Branch $5,543; over Gordon Hollow Branch $9,224, all foregoing McDonald Co.; over branch Sta. 97-71 $486; over branch Sta. 96-94 $415, both Phelps Co.; over railroad $8,196; over Valley Spring Creek $3,246; over Dodge Creek $8,318; over Gabouri Creek $13,294, all foregoing St. Genevieve Co. —to H. H. Ruddell, Springfield, bridges at Sta. 121-38 $5,674; Sta. 111-16 $7,660, both over Muddy Creek, Phelps Co. — to M. Haase, St. Joseph, bridge over South Big Creek, $6,627; over railroad tracks $22,378 — to H. Tidd, Hutchinson, Kan., bridge over White Cloud Creek, Nodaway Co., $7,766; over Long Branch, Linn Co., $7,494—to Pioneer Constr. Co., 270 Grain Exch. Bldg., Kansas City, bridge over Grand River, $68,536; bridge Sta. 351-00 $6,942; Sta. 359-00 $7,012; Sta. 370-00 $46,942; Sta. 404-20 $15,299, all foregoing over Grand River Overflow, Daviess Co.—to Lahar Bros., Booneville, bridge over Drainage Ditch 44, New Madrid Co. $4,273—to J. A. Kerr, Ozark, bridge over Finley Creek, Christian Co., $5,794—to C. H. Atkinson, Watertown, S. D., bridge over Branch Sta. 357-00, Andrew Co., $1,338 — to Carte-Harlin Constr. Co., West Plains, bridge over Black Jack Creek, Crawford Co., $3,985—to W. F. Smith & Co., St. Louis, bridge over Big Bend Rd., St. Louis Co., $6,373 —to B. P. Prater, Harrisonville, bridge over railroad tracks, Clay Co., $15,870. Grand total $314,334. Noted Aug. 14.

N. H., Franklin—State Hy. Comn., Concord, 5 span, 381 ft. deck plate girder bridge, to Eastern States Bridge Co., Concord, $77,537. Noted Aug. 28.

New Jersey—Bd. Freeholders Somerset Co., Court House, Somerville, and Morris Co., Morristown, steel, concrete bridge at county line, Millington Boro, to Culp Constr. Co., East McFarlan St., Dover, $38,103. Est. $50,000. Noted Sept. 18.

Okla., Arapaho — Custer Co., 70 ft. truss bridge with two 27 ft. I-beam approach spans and four 40 ft. I-beam span bridge, on Hy. 5, Project 204, Sect. D, to Grant & Williams, 425½ West Main St., Oklahoma City, $36,694.

Oregon—State Hy. Comn., Salem, bridges on Santiam Hy., in Linn Co., to C. A. Catchings, Roseburgh, $21,919—bridges on Roosevelt Hy., Tillamook Co., to Clackamas Constr. Co., Portland, $83,583.

Pennsylvania—See "Streets and Roads."

Pa., Phila.—Dpt. P. Wks., Bureau Eng. & Surveys, Schedule A, Pennsylvania Terminal Imprvt.; deck, Arch Street viaduct, Contr. 8, to Jafolla & Mark, Inc., 2820 North 21st St., $123,038. Noted Aug. 28 under "Streets and Roads."

Pa., Pittsburgh—Bd. Comrs. Allegheny Co., disposal present bridge, constructing new concrete bridge, Flaugherty's Run, to A. Hanson Co., Grant Bldg., Pittsburgh, $41,155. Est. $52,000.

Pa., Turtle Creek—See "Streets and Roads."

Tex., Houston — Harris Co. (Houston) and Montgomery Co. (Conroe), c/o H. L. Washburn, aud. Harris Co., Houston, timber pile trestle bridge over Spring Creek, to Thomas & Ratliff, Rogers, $34,649. Noted July 31.

Wash., Monitor—Chelan Co., concrete arch structure over Wenatchee River, to H. Hegman, Cashmere, $65,798. Est. $70,000.

Wisconsin — State and Waupaca Co. Hy. Comns., Citizens Bank Bldg., Wisconsin Rapids, Waupaca Overhead, Option A, to Guaranty Constr. Co., 233 Essex Bldg., Minneapolis, Minn., $21,644; Option B, to M. A. Leiberg, Oakfield, $33,010.

Ont., Brampton—N. L. Powell, engr. Peel Co., Court House, Bells Mills, Caledon Bridge, 40 ft. rein.-con. span, to Kidd & McBride, Inglewood—Brampton Bridge, 30 ft. concrete span, to R. Fleming, Brampton—Huttonville Bridge, two 70 ft. span, concrete bow string arches, to Campbell & Lavelle, Brampton — grading on Bolton Hill, to W. W. King, Oakville. Total est. $40,000. Noted Aug. 21.

Ont., Hamilton—S. H. Kent, city clk., rein.-con. bridge connecting Paradise and Longwood Rds., to Stanley Contg. Co., 400 Gage Ave. N., $96,126. Noted Aug. 14.

STREETS AND ROADS

BIDS ASKED

California—Sept. 24, by State Hy. Comn., Sacramento, grading 0.8 mi. Westerly Boundary-Burnt Branch Rd., Trinity Co.—grading, clearing, grubbing, untreated crushed gravel or stone surfacing 1.7 mi. Clarks Corner-Placerville Rd., El Dorado Co.—grading, concrete surfacing 0.9 road through South San Francisco San Mateo Co.—graveling 8.1 mi. Williams-Maxwell Rd., Colusa Co. C. H. Purcell, hy. engr.

California—Oct. 1, by C. H. Purcell, engr. State Hy. Comn., Sacramento, bituminous treated crusher run base surfacing 7.3 mi. San Mateo-Redwood City Rd., San Mateo Co.; grading, concrete paving 1 mi. Castaic Creek Rd., Los Angeles Co.

Calif., Glendale—G. E. Chapman, city clk., taking bids curbing, guttering, walks, asphaltic concrete paving Verdugo Rd. Est. exceeds $50,000.

Calif., Los Angeles—Sept. 24, by Bd. Supervs. Los Angeles Co., grading, curbing, walks, oil surfacing 101,926 sq.ft. Topanga Canyon Ave.

Calif., Oakland—Sept. 25, by G. C. Merritt, city clk., grading, curbing, guttering, sewers, walks, removing wood block pavement, asphaltic concrete repaving 108,645 sq.ft. East 12th St.

Calif., Riverside—City Council taking bids grading 2 course concrete sidewalks, 40,000 sq.ft. Park Ave.

Calif., San Diego — Sept. 30, by Bd. Comrs. San Diego Co., improving Torrey Pines Rd., 220,530 cu.yd. excav., 315,315 cu.yd. embankment, 18- to 34-in. rein.-con. pipe culvert.

Calif., Stockton—Sept. 29, by E. Graham, clk. San Joaquin Co., oiling and graveling roads in Stockton Sub-Division.

Calif., Ventura—Oct. 7, by L. E. Hallowell, clk. Ventura Co., improving Ventura Ave., 34,350 cu.yd. excav., 1,824 cu.yd. Class A concrete paving, 12- to 42-in. corrugated pipe.

Ga., Hogansville — Sept. 26, at office City Clerk, curbing, sewers, concrete, vitr. concrete or brick paving 8,500 sq.yd. Main, College and Oak Sts. K. T. Thomas, Standard Bldg., engr.

Illinois—Sept. 24, by State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, concrete bituminous filled brick on concrete, bituminous concrete on concrete surfacing 1.21 mi. Route 127, Sect. 106, Montgomery Co.—8.38 mi. Route 146, Sect. 110, Johnson Co.—1.07 mi. Route 146, Sect. 111-G, Johnson and Pope Counties—0.74 mi. Route 146, Sect. 112-G and 4.67 mi. Route 146, Sect. 112, Pope Co.—concrete surfacing 1.05 mi. Route 5, Sect. 3-W, Cook Co.—0.08 mi. Route 42, Sect. D-W, Lake Co.—grading 9.6 mi. Route 166, Sect. 101, Williamson and Johnson Counties—70 ft. steel bridge on rein.-con. substructure, Route 166, Sects. 101-B and C, Williamson Co., F. T. Sheets, ch. hy. engr.

Ill., Edwardsville — Sept. 26, by F. J. Schlemer, hu. comr., grading, concrete paving 1,419 ft. Glen Carbon Rd., 16 ft., with 4 ft. shoulders.

Ind., Crown Point—Sept. 22, by Bd. Comrs. Lake Co., concrete surfacing T. J. Sullivan Rd., $116,400; C. N. Scott Rd., $182,400. W. E. Whitaker, Crown Point, engr.

Ind., Indianapolis—Sept. 22, by Bd. Comrs. Marion Co., concrete surfacing Carl Banta Rd. $37,112. H. Dunn, co. aud.

Ia., Denison — Sept. 22, at office Auditor Crawford Co., grading 4.8 mi. secondary roads. W. J. Wearmouth, Denison, co. engr.

Ia., Independence—Sept. 19, at office Auditor Buchanan Co., graveling 9.5 mi. secondary roads.

Streets and Roads (Continued)

Kentucky—Oct. 8, by State Hy. Dpt., Frankfort, **(F.A.P. means Federal Aid Project)** grading, drainage structures 5.8 mi. Livine-Winchester Rd., F.A.P. 82-AG State Aid Project 185-AG Estill Co.—surfacing 10.6 mi. Hodgenville-Bardstown Rd. (Jackson Hy.) F.A.P. 205-AS Larue Co.—reconstructing (surfacing) 9.5 mi. Russellville-Adairsville Rd., State Project 81-AS Logan Co.—concrete bridge and fill approaches over Bullskin Creek near Shelbyville, on Shelbyville-Louisville Rd., F.A.P. 117-B Shelby Co. B. Johnson, chn.

Kentucky—Oct. 15, by State Hy. Dpt., Frankfort, grading, drainage structures 10.3 mi. Owingsville-Morehead Rd., F.A. 137-BS Bath Co.—4.8 mi. Princeton-Gracey Rd., S.P. 280-AG Caldwell Co.—10.6 mi. Brownsville-Leitchfield Rd., F.A. 209-AG Edmonson Co.—4.7 mi. Greensburg-Campbellsville Rd., F.A. 190-BG Green Co.—1.8 mi. East View Rd., S.P. 137-AG Hardin Co.—8 mi. New Haven-Lebanon Rd., S.P. 62-AS Nelson Co.—13.3 mi. Somerset-Russell Springs Rd., F.A. 211-AG Pulaski Co.—6.4 mi. Jamestown-Albany Rd., F.A. 212-AG Russell Co.—6.6 mi. Bedford-Carrollton Rd., F.A. 197-AG Trimble Co.—5.8 mi. Sturges-Shawnee Town Rd., S.P. 121-BG Union Co.—11.9 mi. Bowling Green-Glasgow Rd., F.A. 210-AS Warren Co.—surfacing 12.7 mi. Sandy Hook-Rodburn Rd., S.P. 49-AS Elliott Co.—8.2 mi. Fullerton-Greenup Rd., S.P. 106-DS Greenup Co.—13.7 mi. Vanceburg-Fullerton Rd., S.P. 106-AS Lewis Co.—9 mi. Eddyville-Smithland Rd., S.P. 10-CS Livingston Co.—6 mi. Eddyville-Smithland Rd., S.P. 10-CS Lyon Co.—7.2 mi. Kingston-McKee Rd., F.A. 129-DS Madison Co.—13.3 mi. Rodburn-Sandy Hook Rd., S.P. 49-AS Rowan Co.—steel, concrete bridge, grading approaches over Kentucky River at Hayden, S.P. 28-CB and CG Leslie Co. B. Johnson, chn.

La., Baton Rouge—Sept. 30, by Hy. Comn., grading, drainage structures, 3.3 mi. Project 773-A, Route 200.

Maryland—Sept. 23, by State Roads Comn., Baltimore, sheet asphalt paving 0.91 mi. Contr. BC-96-74 Baltimore City—concrete paving 1.17 mi. Contr. P-138-34, alternate hot and cold bituminous mixture surfacing 1.2 mi. Contr. P-139-32, penetration macadam resurfacing 0.9 mi. Contr. P-140-34—concrete shoulders 0.6 mi. Contr. P-141-32, all foregoing in Prince George's Co. G. C. Uhl, chn.; adv. E. N.-R. Sept. 18.

Massachusetts—Sept. 23, by Dpt. P. Wks., Boston, bituminous macadam paving 14,763 ft. hy. Bridgewater and East Bridgewater. A. W. Dean, Dpt. P. Wks., Boston, engr.

Mass., Boston—Sept. 22, by Dpt. P. Wks., artificial stone sidewalks Wards 17 and 22, $25,000. J. A. Rourke, comr.

Mass., Boston—Sept. 24, by Dpt. P. Wks., J. A. Rourke, comr., artificial stone sidewalks, Ward 3. $25,000.

Mass., Needham—See "Contracts Awarded."

Michigan—Sept. 24, by C. L. Cowgill, resident engr., Plymouth, grading, drainage structures, concrete paving 3.632 mi. FO58-20 Contr. 1, Monroe Co., 40 ft.; 6.165 mi. FO47-18, Contr. 1, Livingston Co., 20 ft., for State Hy. Comn., Lansing.

Michigan — Sept. 24, by Division Engineers Office, Escanaba, grading, concrete paving 2.263 mi. MO2-15, Contr. L, Alger Co., and 3.297 mi. FO22-25, Contr. L, Dickinson Co., both 20 ft., for State Hy. Comn., Lansing. L. N. Jones, Crystal Falls, resident engr.

Michigan—Oct. 2, by R. R. Havens, resident engr., Jackson, grading, drainage structures, concrete surfacing 6.785 mi. MO48-19 Cont. 1 and 2, Lenawee Co., city of Adrian, for State Hy. Comn., Lansing.

Mississippi—Sept. 22, by State Hy. Comn., Jackson, gravel surfacing 13.183 mi. Sects. A, B and C, Oxford-Sardis Rd., Lafayette Co.

Missouri—Sept. 26, by State Hy. Bd., Jefferson City, improving roads in Atchison, Barry, Bates, Benton, Bollinger, Camden, Buchanan, Cass, Cedar, Dallas, Douglas, Dunklin, Greene, Henry, Howell, Iron, Jackson, Jefferson, Laclede, Lawrence, Lewis, Livingston, Maries, Miller, Mississippi, Monroe, Montgomery, New Madrid, Oregon, Ozark, Pettis, Platte, Ralls, Ripley, St. Louis, Schuyler, Scott, Shannon, Stoddard, Texas, Vernon and Wayne Counties. T. H. Cutler, ch. engr.

Nevada—Sept. 24, by Directors Dpt. Hys., Carson City, constructing 11.7 mi. state hy., Route 2, Sects. D and E, Lander Co. S. C. Durkee, state engr.

New York—Oct. 1, by Westchester Co. Park Comn., 72 West Pondfield Rd., Bronxville, grading, paving 1.9 mi. Central Westchester Parkway from Westchester Ave. to Bway., in Harrison, North Castle and White Plains. J. Downer, ch. engr.; adv. E. N.-R. Sept. 18.

N. Y., Brooklyn—Sept. 24, by H. Hesterberg, pres. Brooklyn Boro, Boro Hall, grading curbing, asphalt on concrete paving Linden Blvd., Cortelyou Rd., Locust, Stone, Wyckoff, Bedford Aves., Berriman, Covert, East 4th, East 7th, North 9th Sts.; grading, granite on concrete repaving Bedford Ave.

N. Y., New York—Sept. 19, by J. Miller, pres. Manhattan Boro, Municipal Bldg., grading, curbing, flagging, sidewalks, sheet asphalt on concrete paving un-paved portions and widened areas Forsyth, Hester, Broome, Rivington and Stanton Sts.

N. Y., St. George—Sept. 24, by J. A. Lynch, pres. Richmond Boro, Boro Hall, recurbing, concrete paving Richmond Terrace from Borough Pl. to Stuyvesant Pl.

Ohio—Oct. 3, by R. N. Waid, dir. hys., Columbus, bituminous macadam surface treating 2.309 mi. Sect. E. Cincinnati-Batavia Rd., Clermont Co., est. $37,362.

O., Akron—Sept. 24, by Bd. Comrs. Summit Co., J. P. Riddle, clk., gravel surfacing Sections A-2, B and C, Akron-Peninsula Rd. C. H. 10.

O., Akron—Bd. Control bids about Oct. 4, grading land between abandoned Massillon Rd. and New Massillon Rd., at Municipal Airport. $90,000.

O., Jefferson—Sept. 26, by Comrs. Ashtabula Co., W. W. Howes, clk., grading, drainage structures, bituminous macadam paving 1.18 mi. Myers Rd., Sect. 29, 18 ft. $26,750.

Okla., Fairview—Sept. 23, by G. Shafer, clk. Major Co., gravel surfacing 14 mi. roads, 18 ft., $65,000. F. C. Magruder, Fairview, engr.

Pennsylvania—Sept. 25, at office J. L. Stuart, secy. State Hy. Dpt., Harrisburg, grading, vitr. brick on concrete surfacing 60,006 sq.yd. Route 120, Sect. 4, North Versailles Twp., East Pittsburgh, Braddock, Chalfont and Forest Hills Boros, Allegheny Co.—grading, one course reinforced concrete paving 31,896 sq.yd. Routes 251 and 704, Sect. 6142, Harvey Twp., Park City Boro, Armstrong Co.—27,467 sq.yd. Route 482, Sects. A-7117 and 7018, North Sewickley and Franklin Twps., Beaver Co.—13,157 sq.yd. Route 482, Sect. 7218, Bristol Twp., Bucks Co.—27,164 sq.yd. Route 482, Sect. A-7376, Summit and Jefferson Twps., Butler Co.—4,146 mi. Route 219, Snow Shoe Twp., Centre Co.—10,740 sq.yd. Route 200, Sect. A-7410, Richmond Twp., Crawford Co.—50,580 sq.yd. Route 86, Sect. 5, Mill Creek and Fairview Twps., Erie Co. — 13,800 sq.yd. Route 86, Erie and Millcreek Twp., Erie Co.—3,650 sq.yd. Route 128, Mountville Boro, Lancaster Co.—848 sq.yd. Route 246, Sect. A-6600-A Jackson Twp., Dauphin Co., incl. fabrication and erection two 200 ft. span half through truss bridge, 24 ft. roadway and 5 ft. sidewalk over Slippery Rock Creek—670 sq.yd. Route 175, Sect. S-A-7544, Whitehall Twp., Lehigh Co., incl. one 160 ft. and four 17 ft. span rein.-con. arch bridge with 22 ft. roadway, 4 ft. sidewalk over Spring Creek—6,066 sq.yd. Route 213, Sect. 1, Fairview and Cool Springs Twps., Mercer Co.—5,402 sq.yd. Route 238, Sect. A-6969, South Shenango Twp., Mercer and Crawford Counties—10,113 sq.yd. Route 1, Sect. A-7010 and 7298, Richland Twp., Windber Boro, Somerset and Cambria Counties—11,953 sq.yd. Route 321, Sect. 19, Shrewsbury and Davidson Twps., Sullivan Co. — 8,778 sq.yd. Routes 296 and 365, Sect. A-7363, Starrucca Boro, Wayne Co.—4,794 sq.yd. Route 6, Sect. 3, Canaan Twp., Wayne Co.—41,017 sq.yd. Route 639, Sect. 6-A-7537 and 7538, North Huntington Twp. and Trafford Boro, Westmoreland Co.—grading, bridge flooring, drainage structures 3,228 ft. Route 1, Sunbury and Upper Augusta Twps., Northumberland Co.—grading, bituminous treated macadam surfacing 3,296 sq.yd. Route 200, Sect. A-6600-A, Jackson Twp., Dauphin Co.—fabrication, erection three 154 ft. span through truss bridge, 17 ft. 6 in. roadway, two 5 ft. sidewalks oer Loyal Sock Creek, Route 18, Loyal Stock Twp., Lycoming Co. Adv. E. N.-R. Sept. 18.

Pa., Ellwood City—Sept. 30, by L. W. Monroe, city mgr. and engr., City Hall, concrete approaches and curbs for new viaduct. $30,000. Private plans.

Pa., Phila.—Dpt. P. Wks., Bureau of Hys., A. Murdock, dir., City Hall Annex, cancelled bids to have been opened Sept. 16, improving, grading Overhill Ave.; asphalt paving and improving country roads. Will re-advertise. Noted Sept. 11.

Tex., Harlingen—City, c/o S. Botts, mayor, taking bids alternate types paving 4 blocks, 30 ft. $25,000. A. Tamm, 209½ West Jackson St., engr.

Tex., Liberty—Sept. 24, by Liberty Co., c/o C. R. Wilson, judge, grading, small structures, concrete paving 86,000 sq.yd. Raywood-Rull Rd. G. A. Bracher, Liberty, engr.

Tex., Memphis—Sept. 29, by Comrs. Court, Hall Co., c/o A. C. Hoffman, judge, grading, drainage structures 5.793 mi. County Rd. Job 45, Unit 1, Sect. 3, 26 ft., $30,000; 12.41 mi. same road, Sect. 4, 20 ft. Hasie Eng. Co., Inc., Memphis, engrs.

Wash., Everett — Dec. 15, by Comrs. Snohomish Co., constructing 5 mi. Marysville-Tulalip Hy. $28,000. R. D. Alverson, Everett, co. engr.

Wash., Port Angeles—City Comn. bids about Nov. 5, concrete walks 5 mi. Upper Cherry Hill Dist.

Wash., Seattle—Sept. 29, by Comrs. King Co., grading, graveling 3 mi. Military Rd., 28 ft., Des Moines; and 1 mi. Maple Valley Rd. T. D. Hunt, Seattle, co. engr.

West Virginia — Sept. 23, by State Roads Comn., Charleston, **(P. means Project)** widening with bituminous macadam on stone 15 mi. Martinsburg-Charlestown Rd., P. 3221 Berkeley Co.—grading, concrete paving 0.93 mi. Northwestern Turnpike, P. 145-C—2.4 mi. Northwestern Turnpike, P. 185-A, both Doddridge Co.—retread surfacing 3 mi. Morgantown-Hellick-Grafton Rd., P. 2222 Monongalia Co.—shale surfacing 3.9 mi. Sweet Springs-Virginia State Line Rd., P. 3409 Monroe Co.—grading, retread on stone surfacing 5 mi. P. 3090 Pocahontas Co. — grading, drainage structures 5.25 mi. West Union-Troy Rd., P. 3404-B Doddridge Co.—4 mi. Cumberland-Chester Rd., P. 181-A Hancock Co.—12.5 mi. Ripley-Spencer Rd., P. 3413 Jackson Co.—6 mi. Yawkey-Alum Creek Rd., P. 2463-B Lincoln Co.—5.5 mi. Grafton-Hellick-Morgantown Rd., P. 3479 Taylor Co. E. D. Yewell, ch. engr. Adv. E. N.-R. Sept. 18.

Tex., San Antonio—Oct. 3, by Comrs. Bexar Co., and W. G. Goodman, Court House, engr., grading, spreading, rolling, graveling asphalt paving 4½ mi. St. Cloud Rd. and Woodlawn Dr., 18 and 24 ft. $40,000.

Wyoming — Sept. 26, by State Hy. Comn., Cheyenne, grading 5.095 mi. Cody-Powell Rd., F.A.P. 103-B, Park Co.—base course surfacing 15.5 mi. Cheyenne-Pine Bluffs Rd., F.A.P. 138-D, Laramie Co.—7.839 mi. Deaver-Frannie Rd., F.A.P. 176-D, Big Horn and Park Counties—5.721 mi. Greybull-Lovell Rd., F.A.P. 176-E, Big Horn Co.—crushed gravel surfacing 7.339 mi. S.P.860, Hot Springs Co.—surfacing 10.87 mi. Bosler-Wheatland Rd., S.P. 861, Albany Co.—3 mi. Buffalo-Maycee Rd., S.P. 862, Johnson Co.—two I-beam bridges on Laramie-Bosler Rd., F.A.P. 156-B, Albany Co.—2 timber and rein.-con. bridge on Evanston-West Rd., F.A.P. 55, Uinta Co.

Ont., Windsor—Bids about Sept. 20, sheet asphalt paving 1 mi. East Chatham St., 66 ft. $50,000. A. Desmarais, City Hall, engr.

Que., Low — Municipality, R. Wilkie, secy.-treas., taking bids gravel or waterbound macadam paving 3 mi. each Stackburn, Feildville and Martindale Rds., 1 mi. each Barry-Sullivan and Pike-Lake Rds. $30,000.

CONTRACTS AWARDED

Alabama—State Hy. Comn., Montgomery, to State Board of Administration, Montgomery, grading, surfacing 14.37 mi. Birmingham-Leeds Hy., $162,450—14.2 mi. Birmingham-Jasper Hy., $324,529 — 12.95 mi. Mobile-Axis Hy., $143,708, all foregoing in Jefferson Co., 18 ft. Grand total $630,687. Noted Sept. 4.

Arizona—State Hy. Comn., Phoenix, grading, bridging Yuma-Wellton Hy., F.A.P. 26-D, Reopened, to Canion & Francis & Royden, 2012 West Van Buren St., Phoenix, $77,693; 8.7 mi. Tucson-Nogales Hy., F.A.P. 86-E, to Skeels & Graham Co., Tucson, $78,025.

Arizona—State Hy. Comn., Phoenix, grading, surfacing 15 mi. Springerville-New Mexico State line Hy., Apache Co., to Tenney & Black, Clifton, $24,818.

Ark., Newport—Grading, paving 15 blocks, to T. J. Jones & H. Brown, 507 West 4th St., North Little Rock, $41,870; 3rd St., Impvt. Dist. 14, to J. Stanton, Iola, Kan., $46,340.

California—State Hy. Comn., Sacramento, grading concrete and bitumonous treated decomposed granite paving 3.1 mi. road between Anaheim St. in Long Beach and Seal Beach, 40 ft., Los Angeles Co., and grading and widening from 20 to 30 ft. existing concrete pavement 3.3 mi. Seal Beach-Sunset Beach Rd., Orange Co., to T. M. Morgan Paving Co., Los Angeles, $191,604 and $98,432 respectively. Noted Aug. 28.

California — State Hy. Comn., Sacramento, furnishing and applying seal coat to existing bituminous macadam 14.5 mi. Shandon East Boundary Line Rd., to F. Nighbert, Bakersfield, $14,998. Noted Sept. 4.

California — State Hy. Dpt., Sacramento, grading 1 mi. Willow-Redwood City Rd., to Basich Bros. Constr. Co., Torrence, $83,416.

Calif., Alturas — Curbing, walks, asphaltic concrete on crushed rock paving 29,000 sq.yd. Main St., to Valley Paving & Constr. Co., Visalia, $123,861. Noted Sept. 4.

Calif., Gilroy — Grading, curbing, walks, asphalt paving 500,000 sq.ft. Rosanna St., et al., to Hanrahan Co., Standard Oil Bldg., San Francisco, $77,775. Noted Sept. 4.

Calif., Glendale—Grading, asphaltic concrete paving Bway. in Moorpark Tract, to Atkinson & Reish, 1241 Ethel St., $68,317.

Calif., Hayward—Grading, curbing, guttering, walks, 6 in. full penetration emulsified asphaltic macadam paving 165,000 sq.yd. Smalley and Laurel Sts., to M. J. Bevanda, Savings & Loan Bldg., Stockton, $44,561.

Calif., Los Angeles—Bd. P. Wks., grading, sanitary and storm sewers, 6 in. concrete paving 215,000 sq.ft. Yorkshire Dr. and Parish Avenue Dist., to M. Miller, 208 West 2nd St., $115,355; sanitary and storm sewers, grading, warrenite bitulithic paving 268,000 sq.ft. and 2 in. warrenite bitulithic on 3½ in. asphalt paving 145,000 sq.ft. Western Ave., to Southern California Roads Co., 530 West 6th St., $91,385. Noted Aug. 21.

Calif., Los Angeles—Grading, curbing, guttering, walks, warrenite bitulithic paving Walgrove Ave., to P. J. Akmadzich, 3028 Gilroy St., $63,695.

Calif., Redwood City — Grading, curbing, walks, 5 and 7 in. concrete on 1 in. sand and 3 in. rock cushion paving 135,000 sq.yd. Hawes St., et al., to W. O. Tyson, Redwood City, $50,380. Noted Aug. 28.

Calif., Riverside — G. A. Mills, city clk., grading, curbing, guttering, walks, lighting system, rein.-con. bridge, concrete paving A and I No. 3 West Entrance to city, to Matich Bros., Elsimore $148,156.

Calif., San Francisco—Bd. P. Wks., grading 84,000 sq.yd. and asphalt macadam surfacing 92,000 sq.ft. Contr. 21—Sect. B, Sunset Blvd., to M. Rosenberg, 1755 San Bruno Ave., $83,766. Noted Aug. 21.

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Streets and Roads (Continued)

Calif., San Jose — Santa Clara Co., asphalt paving North 10th St., to Union Paving Co., Call Bldg., San Francisco. $14,750; Alma Ave. et al., to A. J. Raisch, 46 Kearny St., San Francisco, $23,333.

Calif., Santa Ana—Curbing, guttering, walks, 5 in. concrete paving 235,000 sq.ft. Parton St., St. Andrews Pl., et al., to P. P. Janisch, 2001 Eucalyptus Ave., Long Beach, $47,545.

Calif., Shasta—Shasta Co., improving Weed-Klamath Falls Rd., to Colley & Cuffe, Masonic Bldg., San Rafael, $51,685.

Colorado—State Hy. Dpt., Denver, gravel surfacing 5.533 mi. State Hy. 17, north of La Jara, Conejos Co., to Driscoll Constr. Co., 220 South Main St., Pueblo, $49,311.

Colorado—State Hy. Dpt., Denver, gravel surfacing 2.481 mi. State Hy. 6, east of Cimarron, Montrose and Gunnison Counties, to J. H. Miller & Co., Denver, $50,273.

Connecticut — J. A. Macdonald, hy. comr., Hartford, graveling, waterbound macadam paving 8,725 ft. hy. Rocky Hill, to A. Brazos & Son, Middletown, $25,773—7,016 ft. Trumbull to J. Vervello, New Haven, $38,005—9,851 ft. Redding and 22,846 ft. Danbury, to Osborne & Barnes, Odd Fellows Bldg., Danbury, $45,118 and $101,674 respectively—6,475 ft. Middlefield and 10,078 ft. Scotland to H. T. Smith Express Co., Railroad Station, Meriden, $23,766 and $26,941 respectively—6,500 ft. North Fairfield to J. De Michiel & Bro., 58 High St., Torrington, $38,825 — 828 ft. Shelton and 17,465 ft. Orange, to New Haven Constr. Co., 70 Hill St., New Haven, $6,624 and $59,942 respectively. Grand total $366,668.

Conn., New Haven — Bituminous macadam paving Haven St., to D. V. Frione Co., 105 Ward St., $6,860—Saltonstall Ave., to Edgewood Concrete Co., Edgewood St., $10,370—Parmlee Ave. and High St., to J. F. Morrissey, New Haven, $6,850. Grand total $24,080. Est. $25,000.

Idaho—Dpt. P. Wks., Bur. Hys., Boise, plant mixed surfacing 8.085 mi. Yellowstone Park Hy., Franklin Co., to O. Nelson, Logan, Utah, $103,726.

Idaho—J. D. Wood, comr. P. Wks., Boise, constructing 1.073 mi. North and South Hy., F.A.P. 29-C, Carlin Bay, Kootenai Co., to Clifton, Applegate & Toole, Spokane, Wash., $30,079.

Illinois—State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, paving Route 78, Sect. 141 and Route 78, Sect. 143, Mason Co., to W. F. Smith & Co., St. Louis, Mo., $136,885 and $116,115 respectively—road in DuPage Co., to Stanley Jaicks Co., Oak Park, $76,676—Route 46, Sect. 464Y, to J. Mackler & Co., Chicago Heights, $52,284—Route 46, Sect. 463Y, to Airey Constr. Co., Oak Park, $32,361—Route 46, Sect. 91Y, to Broadway Constr. Co., 205 West Wacker Dr., Chicago, $73,485, all foregoing Cook Co.—road in Mercer Co., to J. L. Wells Co., Rock Island, $32,669—McHenry Co. and grading road in Will Co., S. J. Groves & Sons, 306 Globe Bldg., Minneapolis, Minn., $23,196 and $71,948 respectively — Christian Co., to H. M. Johnson Constr. Co., Mt. Olive, $38,126. Grand total $643,745. Noted July 3 and 24.

Ill., Aurora — Curbing, guttering, warrenite bitulithic paving 32,200 sq.yd. Calumet, Gladstone and La Grande Sts., to McCarthy Impvt. Co., Kahl Bldg., Davenport, Ia., $119,025.

Ill., Belleville — Grading, curbing, guttering, sewers, rein.-con. paving 10,974 sq.yd. North Church Street Paving Dists., to B. A. Gundlach, 623 East Main St., $37,195. Est. $40,568.

Ill., Monmouth — Grading, curbing, vertical fibre brick on concrete paving 44 blocks North Main St., 36 ft., to Monmouth Constr. Co., Lahl Bldg., $16,679. Est. $25,000. State pays for 18 ft. width, and furnishes 755 bbl. cement.

Ind., Brazil—Bd. Comrs. Clay Co., graveling Stearly Rd., to H. Quinn, Terre Haute, $4,882; 2.75 mi. Diel Rd., to W. J. McGuire, Brazil, $17,722. Total est. $34,046. Noted Aug. 28.

Ind., Columbia—Whitley Co., gravel surfacing 32,430 ft. L. Lincoln Lee Rd., to Carvey, Tombaugh & Carvey, Macy, $19,860. Est. $34,-138. Noted Aug. 28.

Ind., Evansville—Vanderburgh Co., asphaltic concrete paving Keck Avenue Rd., Pigeon Twp., to Reichert Constr. Co., Furn Bldg., $30,550 est. $30,608; gravel and stone surfacing 2.5 mi. Gostlile-Nurrenben Rd., Perry Twp., to Globe Constr. Co., West Side Bank Bldg., $24,174 est. $27,399.

Ind., Indianapolis—Bd. P. Wks., widening, asphalt resurfacing 28,016 sq.yd. East New York St., to J. N. Morgan & Son, 506 Inland Bank Bldg., $67,907. Est. $110,057.

Ind., Lafayette—Bd. Comrs. Tippecanoe Co., concrete surfacing Edwin Gault Rd., Fairfield Twp., to D. M. Vaughn, Lafayette, $50,500. Est. $65,000. Noted Aug. 28.

Ind., Vincennes—Knox Co., graveling 2 roads, to O'Connell Sand & Gravel Co., Vincennes, $8,100; 1 road to Grant, Myers & Son, Sandborn, $24,700. Grand total $32,800.

Ia., Emerson — Grading, curbing, guttering, concrete paving 11,600 sq.yd., to Booth & Olson, Sioux City, $27,000. Noted Aug. 28.

Ia., Guthrie Center—Graveling 5.5 mi. trunk road, to R. Cook, Nevada; 30,000 cu.yd. excav. on local roads, Baker Twp., to J. Shipley, Guthrie Center, at $0.24 per cu.yd. Noted Aug. 7.

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Ia., Red Oak—Montgomery Co., grading 1.23 mi. trunk roads, 2.6 mi. local roads, to Chris Nelson Constr. Co., Fremont, Nev. Est. $30,000.

Kansas—State Hy. Comn., Court House, St. Marys, concrete paving 1.491 mi. Project 40-30-B Federal Aid Project 255-H, Pottawatomie Co., to Cook & Stucker, Ottawa, $31,875. Noted July 31.

Kansas—State Hy. Comn., Topeka, to Western Bridge & Constr. Co., 3867 Leavenworth St., Omaha, Neb., gravel or chats surfacing 11 mi. roads Project 889, $11,880; 1.25 mi. Project 890, $1,350, both Barber Co.; 4.531 mi. Harper Co., $3,935—to Yant Constr. Co., 905 Omaha Natl. Bank Bldg., Omaha, Neb., 8.918 mi. Harper Co., $7,481—to M. W. Watson, Mulvane Bldg., Topeka, regraveling 2 mi. Project 7067, $1,076; 5 mi. Project 7069, $2,910, both Coffee Co.—to A. G. Sherwood, Independence, 12 mi. Montgomery Co., $1,269; 5 mi. Wilson Co., $502—to Cook & Cone, Ottawa, 5 mi. Greenwood Co., $2,350—to Du Bois & Co., Pittsburg, 9 mi. Wilson Co., $1,233—to W. D. Shay, McPherson, 11.5 mi. Chautauqua Co., $4,500—to W. F. O'Brien, St. Paul, 4 mi. Neosho Co., $1,880.

Kan., Kansas City—Curbing, guttering, 3 in. brick on 8 in. concrete paving State Avenue Traffic Way, to Tobin Constr. Co., 226 West 39th St., Kansas City, Mo., $107,070; Central Avenue Traffic Way, to T. P. Thompson, 3908 Forrest Ave., Kansas City, Mo., $57,735.

Kan., Ness City—Grading, curbing, 2½ in. brick on concrete paving 20,000 sq.yd., to Cook & Ransom, Ottawa.

La., New Orleans — Concrete sidewalks on 10,858 ft. Laffitte Ave., Sophia Wright Pl., Monroe, Octavia and North Robertson Sts., to Globe Constr. Co., Louisiana Bldg., $28,360.

Maryland — State Roads Comn., Baltimore, graveling 2 mi. Contr. AA-98-84, Anne Arundel Co., to E. R. James, Havre De Grace, $18,718. Noted Aug. 21.

Maryland—State Rds. Comn., Baltimore, concrete paving 1.9 mi. Somerset Co., to P. D. Phillips & Bro., Salisbury, $66,755. Noted Aug. 28.

Maryland—State Rds. Comn., Baltimore, concrete paving 1 mi. Wicomico Co., to Layfield & Waller Paving Co., Salisbury, $13,970—0.38 mi. Anne Arundel Co., to Jerboe & Haughton, Mechanicsville, $6,826 — sheet asphalt paving 0.9 mi. Baltimore Co., to Amer. Paving & Constr. Co., 2525 Montebello Ave., Baltimore, $83,953—macadam resurfacing 3 mi. Harford Co., to T. B. Gatch, Belair Rd., Baltimore, $80,508—penetration macadam resurfacing 1.46 mi. Howard Co., to Thomas, Bennett & Hunter, Westminster, $20,317—amiesite paving 1.4 mi. Baltimore Co. to P. Flanigan & Sons, Harford Rd. and Baltimore & Ohio R. R., Baltimore, $14,426. Grand total $220,000. Noted Aug. 28.

Maryland — State Rds. Comn., Baltimore, macadam paving 0.65 mi. Queen Anne Co., to P. D. Phillips & Bro., Salisbury, $14,899; concrete paving 1.23 mi. Harford Co., to G. & L. Contg. Co., Maple Ave., Overlea, Baltimore, $24,-532. Noted Aug. 14.

Maryland — State Rds. Comn., Baltimore, graveling 3.84 mi. Prince Georges Co., to L. R. Colbert, Fredericksburg, Va., $19,057. Noted Aug. 7.

Mo., St. Louis — Bd. P. Serv., City Hall, warrenite bitulithic paving Bent Ave. and Mimika St., to Central Paving & Constr. Co., 411 North 7th St., $21,018 and $23,740 respectively—asphalt paving Itaska St. and Temple Pl., to Asphalt Paving Co., 1328 Sublette Ave., $20,677 and $11,670 respectively—Binghamton St., to Trinidad Asphalt Mfg. Co., 600 South Theresa Ave., $65,940—concrete paving Watson Rd., to Kesl-Lonergan Co., 4829 Easton Ave., $8,717—alleys in City Blocks 4141, 5339, 5646, 5363, 5364, and 5835, to Creech Constr. Co., 4150 Bingham Ave., $15,436 — Sidewalk Projects, to Bridges Asphalt Paving Co., 1411 Central Industrial St., $3,909 — Sidewalk Projects 4124, 4125, 4128, 4129, 4130, 4133 and 4134, to J. C. Redd & J. W. Mullins, 8246 Jefferson Ave., Vinita Park, $5,020. Grand total $176,127. Noted Aug. 7.

Maryland — State Roads Comn., Baltimore, concrete paving 2.17 mi. Contr. K-56-22, Kent Co., to Old Line Contg. Co., Chestertown, $26,-436. Noted Sept. 4.

Md., Towson—Baltimore Co., concrete paving 0.92 mi. roads Group 9, Seminary Ave., to F. D. Carozza & Son, 2444 North Charles St., Baltimore, $31,247. Noted Aug. 28.

Massachusetts—Dpt. P. Wks., Boston, bituminous macadam paving 7,500 ft. hy. Framingham, to Middlesex Constr. Co., 24 Union Ave., Framingham, $24,879. Noted Sept. 4.

Massachusetts—Commonwealth of Massachusetts, Boston, rein.-con. paving 2,356 ft. hy. Acton, to J. J. Watkins, 18 Glenwood St., Amesbury, $12,300. Noted Aug. 28.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr. sheet asphalt paving East 8th St. and East 3rd Sts., Wards 6 and 7, to M. F. Gaddis, 6 Beacon St., $88,782.

Mass., Boston — City, Dpt. P. Wks., J. A. Rourke, comr., recut granite block paving Norfolk Ave., Wards 7 and 8, to B. E. Grant, 100 Floyd St., Roxbury, $36,716.

Mass., Chelsea (br. Boston)—Concrete paving Everett Ave., to T. F. McCarty, 342 Bway., Revere. Est. $25,000.

Mass., Needham—Town, bituminous macadam paving Sargent St., day labor. Est. $25,000. L. C. Holks, Town Hall, engr.

Michigan—E. R. Benkert, resident engr., Port Huron, grading, shaping, concrete paving 0.436 mi. Assessment Dist. 1141, Contr. 1, Sanilac Co., to G. H. Haynes, Caro, for State Hy. Comn., Lansing. $24,833. Noted July 24.

Michigan — H. C. Fleming, resident engr., Grand Rapids, grading, shaping, 2 course gravel surfacing 3.576 mi. Assessment Dist. 483, Contr. 1, 12 ft., Ionia Co., to E. J. Vander Veen, Grand Rapids, for State Hy. Comn., Lansing. $25,971 incl. cement. Noted July 17.

Michigan—L. N. Jones, resident engr., Crystal Falls, grading, shaping, drainage structures 7.758 mi. FO36-14, Contr. 1, Iron Co., to Garvey-Weyenberg Constr. Co., Appleton, Wis., for State Hy. Comn., Lansing. $92,486 incl. cement. Noted July 17.

Michigan — R. W. Roberts, resident engr., Saginaw, grading, graveling, 2.701 mi, Mo26-16, Contr. 1, Gladwin Co., 21 ft., to L. M. Perry, Beaverton, for State Hy. Comn., Lansing. $36,-962. Noted Aug. 15.

Mich., Detroit — City, grading, curbing, 3½ in. sheet asphalt on 8 in. concrete paving 16,000 sq.yd. West Chicago Ave., to Cooke Asphalt Paving Co., Penobscot Bldg., $49,461.

Mich., Detroit — Grading, concrete curbing, circles, 3½ in. asphalt on 8 in. concrete paving 10,780 sq.yd. Alter Rd. from Warren Ave. to Outer Dr., to Detroit Asphalt Paving Co., 909 Transportation Bldg., $32,294.

Mich., Ferndale—J. F. Gibbs, city mgr., grading, curbing, one course concrete paving 12,000 sq.yd. Troy, Alban, Jewell and Camden Aves., to Royal Oak Cement Constr. Co., Royal Oak, $30,403. Noted Aug. 7.

Minn., Lakefield—City, grading, curbing, guttering, concrete paving 16,300 sq.yd. Main St., to Booth & Olson, Sioux City, Ia., $48,000.

Missouri—State Hy. Bd., Jefferson City, to Harrison Eng. & Constr. Co., 506 Mutual Bldg., Kansas City, grading, concrete paving 162.06 mi. Cole County-Freeburg Rd., Osage Co., $179,717; 168.06 mi. Benton-Sikeston Rd., Scott Co., $331,632—to E. L. Markham, Cape Girardeau, 0.316 mi. in Senath, Dunklin Co., $9,908—to Stenby Constr. Co., Kirkwood, 0.227 mi. Big Bend Rd., St. Louis Co., $21,849—to B. P. Prater, Harrisonville, 0.229 mi. near Lanson, Clay Co., $7,115—to M. Haase, St. Joseph, 92.29 mi. Pattonsburg-Route 6 Rd., Daviess Co., $74,712—to C. H. Atkinson Paving Co., Watertown, S. D., grading 2.557 mi. Route 1, New Point Rd., Holt Co., $9,152; 3.151 mi. Route 71-Fillmore Rd., Andrew Co., $10,849 — to Pioneer Constr. Co., 270 Grain Exch. Bldg., Kansas City, 2.248 mi. Pattonsburg-Route 6 Rd., Daviess Co., $31,518—to H. Tidd, Hutchinson, Kan., 4.518 mi. Maitland-Route 71, Nodaway Co., $15,618; stone surfacing 3.795 mi. Kidder-Altamont Rd., Daviess Co., $16,586; 3.896 mi. Route 36-Kidder Rd., Caldwell Co., $10,801; graveling 3.75 mi. Purdin Rd. E., Linn Co., $16,144 — to M. E. Gillioz, Monett, 1.85 mi. Newburgh Spur Rd., Phelps Co., $21,787; 2.008 mi. Pineville-Arkansas State Line Rd., McDonald Co., $33,947; 5.538 mi. St. Genevieve-St. Mary's Rd., Ste. Genevieve Co., $71,038 — to Graham Bros., 6519 East 37th St., Kansas City, 4.115 mi. Weston-Route 92 Rd., Platte Co., $49,727; 1.391 mi. Tory-Winfield Rd., Lincoln Co., $3,574—to Lahar Bros., Booneville, 1.843 mi. McGuire-Reference 7 Rd., Dunklin Co., $9,492; 2.655 mi. Para-Risco Rd., New Madrid Co., $14,740; 2.48 mi. same road, $11,120—to H. H. Ruddell, Springfield, 4.299 mi. Lamont-Green Ridge Rd., Pettis Co., $19,697—to Carte-Harlin Constr. Co., West Plains, 2.352 mi. Steelville-Cherryville Rd., Crawford Co., $10,456. Grand total $1,013,159.

Mo., Fredericktown—Curbing, guttering, concrete paving 9,600 sq.yd. South Main St., to Tidd & Cole, Fredericktown, $28,160.

Mo., St. Louis—Bd. P. Serv., City Hall, to Bridges Asphalt Paving Co., 1411 Central Industrial St., sidewalks on Projects 4089, 4091, 4092, 4093, 4096, 4099 and 4101, and grading, concrete paving Projects 4101, $3,006—to J. C. Redd & J. W. Mullins, 8246 Jefferson Ave., Vinita Park, sidewalks, Projects 4090, 4094, 4095, 4097, 4098, 4100, 4102 and 4103, $3,401—to Webb-Boone Paving Co., 5103 Fyler Ave., asphaltic concrete paving 2,100 sq.yd. Nashville Ave., $11,028—to Flinn Paving Co., 1405 South 1st St., 4,115 sq.yd. Labadie Ave., $26,790—to Central Paving & Constr. Co., 411 North 7th St., warrenite bitulithic paving 5,300 sq.yd. Tholozan Ave., $34,454; 1,040 sq.yd. Tholoran Ave., $7,420; 3,000 sq.yd. Palm St., $20,331; 3,500 sq.yd. Humphrey St., $22,980—to Perkinson Bros. Constr. Co., 3237 Carter Ave., rein.-con. paving 2,535 sq.yd. Kraft St., $11,842—to Stiers Bros. Constr. Co., Garrison Ave. and Magazine St., vibrolithic concrete paving 4,200 sq.yd. Gimblin St., $19,626—to Everman Constr. Co., 1210 South Grand Blvd., 956 sq.yd. 13th St., $13,735; 690 sq.yd. Papin St., $3,576—to W. A. Riley Constr. Co., 706 Chestnut St., 1,000 cu.yd. Limit Ave. $4,855. Grand total $183,044. Noted Apr. 7.

Mo., University City—E. L. Bruns, city clk., to Webb-Boone Paving Co., 5103 Fyler Ave., St. Louis, rein.-con. paving 1,500 sq.yd. Julian Ave., $3,934—to E. Fehlig & Co., Inc., 14 South Central Ave., Clayton, 2,300 sq.yd. Bartmer St., $5,629; 1,480 sq.yd. Jackson Ave., $3,730; 3,530 sq.yd. Chamberlain St., $8,390. Grand total $21,683.

Nebraska—State Hy. Comn., Omaha, grading, culverts, paving 2 mi. Omaha-Elkhorn Rd. S.A.P. 644-A, to Yant Constr. Co., 903 Omaha Natl. Bank Bldg., Omaha, $46,638.

Neb., Wilber—Saline Co., graveling 19.5 mi. Tobias-Friend Rd. Project, to Abel Constr. Co., 308 Terminal Bldg., Lincoln.

Streets and Roads (Continued)

Nevada—Directors Dpt., Hys., Carson City, grading surfacing 12.62 mi. State Hy. Nevada-California state line to Jean, Clark Co., to A. D. Drumm, Jr., Fallon, $47,839. Est. $73,898. Noted Aug. 28.

New Hampshire—State Hy. Dpt., Concord, 3 in. on 5 in. gravel surfacing 2,605 cu.yd. Central Rd., Concord to Arboria Road Constr. Co., Inc., 408 Main St., Hartford, Conn., $35,167. Est. $40,000. Noted Aug. 28.

N. J., Hackensack—Bd. Freeholders Bergen Co., Court House, grading, concrete paving 4 mi. Route 4, from Arcola to Hackensack River to G. M. Brewster & Son, 253 West Fort Lee Rd., Bogota, $692,604. Noted Aug. 21.

N. J., Irvington (br. Newark)—Bd. Freeholders Essex Co., Court House, Newark, curbing, sheet asphalt on concrete paving Clinton Ave., Sect. 1, to Union Paving Co., 315 Butler Ave., Phila, Pa., $87,950.

N. J., Newton—Bd. Freeholders Sussex Co., Court House, grading, graveling Morris Lake Rd., Sect. 2, Sparta, to Sebastian Puntasecca, Hackensack, $17,009; Colesville-New York State Line Rd., to Gallagher & Cozine, 174 16th Ave., Paterson, $10,798. Noted Aug. 14.

N. J., Orange—Essex Co., Hall of Records, Newark, 2 course sheet asphalt paving Orange Park, to Standard Bitulithic Co., foot Brill St., Newark, $23,600. Noted Sept. 3 Daily.

N. J., Toms River — Bd. Freeholders Ocean Co., Court House, concrete paving Long Beach Blvd., to Grant Constr. Co., Morrisville, Pa., $44,029; West Water St., to Riverside Constr. Co., Riverside, $55,038.

N. J., Morristown — Bd. Freeholders Morris Co., Court House, curbing, guttering, concrete paving road between Gladstone and Pottersville, to Culp Constr. Co., East McFarlan St., Dover, $35,405. Est. $45,000.

N. J., Nutley—Town Com., Town Hall, curbing, guttering, paving Bloomfield Ave., Harrison and Church Sts., to Union Building & Constr. Co., 150 Prospect St., Passaic, $55,035. Est. $65,000.

N. J., Plainfield—Union Co., Court House, Elizabeth, paving Park Ave., to J. E. Burke, Plainfield, $132,956. Noted Aug. 28.

N. J., Toms River—Ocean Co., paving West Water St., to Riverside Constr. Co., Riverside, $55,937—Washington St., to Utility Constr. Co., New Brunswick, $13,325—Long Beach Blvd., Beach Arlington, to Grant Constr. Co., Morrisville, Pa., $44,028. Grand total $113,290.

N. J., Trenton—Bd. Freeholders Mercer Co., Court House, concrete paving 19,818 sq.yd. Washington Crossing-Pennington Rd., to D. S. Tyson, Morrisville, Pa., $101,139.

N. Y., Malverne—Village Bd. paving, installing drainage system, to Andrew Weston Co., Woodmere, $144,360.

N. Y., Rochester—City Purchasing Agent, asphalt paving South Ave., to J. Petrossi, 6 State St., $41,298.

N. Y., Syracuse — Paving Erie Blvd., to Syracuse Paving & Constr. Co., Solar St., $57,934.

N. C., Greensboro—Guilford Co., resurfacing 15 mi. hy., to R. G. Lassiter Co., Raleigh, $33,422.

O., Bowling Green—Wood Co. Comn., grading, waterbound macadam paving 2 mi. and traffic bound macadam paving 1 mi. hy., 18 ft., to Nixon Constr. Co., Bowling Green, $30,734.

O., Canton—Bd. Control, widening, brick on concrete paving Market Ave. N. from 6th to 9th Sts., to General Asphalt Paving Co., Witters Bldg., $38,398. Est. $40,000.

O., Canton—Bd. Control, curbing, sidewalks, grading, brick paving 5th St. N. W., from Broad to Wertz Sts. N. W., and 2nd St., from Belden Ave. and Girard St., to H. Corl, Canton, $25,433. Est. $25,000.

O., Cincinnati—Granite curbing, cement sidewalks, concrete paving 13,000 sq.yd. Queen City Ave. from Beekman St. to Seegar Ave., to C. O. Baldwin, c/o office C. A. Dykstra, city mgr., City Hall. $45,211. Est. $53,503.

O., Dayton — City Comn., asphalt paving streets crossed by overhead grade elimination, to Republic Asphalt Paving Co., North Summit St. and Pennsylvania R.R., $163,744.

O., Lisbon—Columbiana Co., grading, drainage structures, limestone paving 6.42 mi. Salem-Valley Rd., to Clements & Orr, Lisbon, $80,462; 3.15 mi. New Waterford-Negley Rd., to G. B. Patterson, Wellsville, $40,059, both 18 ft.

O., Lisbon—Columbiana Co., slag surfacing Bell Schoolhouse Rd., Clarkson-Calcutta Hy., St. Clair Twp., to C. T. Deem, East Liverpool, $25,000.

O., Medina—Medina Co., hauling, limestone surfacing 17,220 cu.yd. Monteville and Homer Rds., to F. O. Bohley, Medina, $31,045; 19,150 cu.yd. Brunswick and Spencer Rds., to E. D. Doebel, Medina, $35,177.

O., Minerva—Village, 6 in. concrete over old brick resurfacing Market and Valley Sts., to Keeley Contg. Co., Dover, $25,060. Est. $25,000.

O., Parma (br. Cleveland) — Village, stone curbing, concrete surfacing Keystone Rd. and Grovewood Ave., to Baldwin Bros., Union Trust Bldg., Cleveland, $29,029 and $12,286 respectively; Chesterfield Ave., to Loesch & Green Constr. Co., 4169 Pearl Rd., Cleveland, $16,540. Grand total $57,855.

O., Youngstown—Mahoning Co., paving, laying sidewalks on Windsor and Prestwick Drs., Boardman Twp., to Victor Olson Co., Mahoning Bank Bldg., $26,543.

Okla., Oklahoma City—M. Peshek, city clk., widening, paving 22 blocks East 23rd St., to Western Paving Co., Petroleum Bldg., Oklahoma City, $115,644. Est. $125,000. Noted Aug. 28.

Oregon—State Hy. Comn., Salem, grading, resurfacing 3 mi. Roosevelt Hy., Tillamook Co., and 5.7 mi. Old Oregon Trail, Baker Co., to Joslin & McAllister, Spokane, Wash., $36,570 and $74,922 respectively.

Pennsylvania — State Hy. Dpt., Harrisburg, concrete surfacing 28,384 sq.yd. roads in Schuylkill, Carbon and Luzerne Counties, to D. L. Risser, Lebanon, $121,059—17,510 sq.yd. Westmoreland Co., to M. Bennett & Sons, Indiana, $113,519—16,317 sq.yd. Fayette Co., to Fort Pitt Constr. Co., 1308 Penn Ave., Pittsburgh, $117,183 — 12,788 sq.yd. Northumberland Co., to C. P. Bell Constr. Co., Sunbury, $59,441 — grading, two course slag surfacing 9,500 sq.yd. McKean Co., to C. R. Kimbraugh, North East, $22,397—40 ft. rein.-con. I-beam bridge in Snyder Co., to R. H. Benson Co., Athens, $8,271. Grand total $441,930. Noted Aug. 7.

Pa., Phila.—Dpt. P. Wks., Bureau Eng. & Surveys, Schedule B, Germantown and Chestnut Hill Elevated—grading, paving, sewers, Contr. 101, to Jafolla & Mark, Inc., 2820 North 21st St., $97,476. Noted Aug. 28.

Pa., Pittsburgh—Bd. Comrs. Allegheny Co., grading, curbing, sewers, concrete paving 7,500 sq.yd. Crawford Run Rd., also 80 cu.yd. concrete wall, 20,000 sq.ft. sidewalks in East Deer Twp., to F. S. Tillman & Co., 328 4th Ave., Tarentum, $41,000.

Pa., Turtle Creek—Bd. Comrs. Allegheny Co., paving bridge, approaches to Moss Side Boulevard Bridge, to R. H. Cunningham Co., 619 Penn Ave., Turtle Creek, $41,788. Est. $45,000.

Tenn., Cookeville—Grading, curbing, concrete paving 20,200 sq.yd. West Broad St., to T. C. Jones, Athens, $38,942. Noted Aug. 15.

Tenn., Nashville — To Clayton Paving Co., Hill Bldg., widening, 7th Ave. $8,445—to Eller & Olsen, Cotton States Bldg., widening, rebuilding Dallas Ave. $9,759; Gay St., $12,021; Petway St. $5,351. Grand total $35,577. Noted Aug. 21.

Tex., Dallas — Grading, drainage structures Outer Blvd., Dist. 2, Unit 2 from Beckley Rd. to Fort Worth Pike, 26 ft., to J. Lee & C. A. Vilbig, 2517 Eakin St., $181,894. Est. $200,000.

Utah—State Rd. Comn., Salt Lake City, Sept. 8, grading, surfacing 7.014 mi. Garfield Co., to W. W. Clyde & J. W. Whiting, Springville, $60,018; grading 3.79 mi. Laketown Canyon Rd., Rich Co., to Wheelwright Constr. Co., Ogden, $27,471. Noted Sept. 4.

Virginia—State Hy. Comn., Richmond, clearing, gurubbing, grading, one course macadam surfacing 9,998 mi. road from Princess Anne Courthouse, Princess Anne Co., to point near Great Bridge, Norfolk Co., convict labor. This corrects report in Sept. 11 issue under "Contracts Awarded."

Wash., Seattle—Bd. P. Wks., paving East 47th St. et al. and 36th Ave. N.E., to Moceri Bros., 816-29th Ave., $51,079 and $67,985 respectively.

Wisconsin—State Hy. Comn., State Bd. Control, and Winnebago, Manitowoc and Kewaunee Counties Hy. Comn., Nicolet Bldg., Green Bay, concrete paving 0.1498 mi. State Hospital Rd., to Larsen-Morgan Co., Oshkosh, $5,987 — graveling 4.961 mi. Sturgeon Bay-Kewaunee Rd., to Schultz Bros., Shawano, $5,030 — grading same road, to Krueger Constr. Co., Algoma, $34,785—constructing Millhome Bridge, to G. Probst, Menasha, $13,097. Grand total $58,899. Noted Sept. 5.

Wisconsin — State and Green Lake Co. Hy. Comns., Wisconsin Rapids, concrete paving 1.4 mi. Green Lake Station-Green Lake Rd., S. P. 4531, to Morris Martin Co., Berlin, $24,214.

Wisconsin—State and Marathon Co. Hy. Comn., Wausau, grading, concrete paving 10.04 mi. Abbotsford-Wausau Rd., to Garvey-Weyenberg Constr. Co., Appleton, $305,390. Noted Aug. 28.

Wis., Wauwatosa—Bd. P. Wks., paving Center, Wells and Park Sts., to Jacobus & Winding, 181 Church St., Wauwatosa, $57,538; 1 alley, Currie Pl., Diamond, 11th and 12th Aves., to A. E. Ratzlaff, 861 Island Ave., Milwaukee, $9,402. Noted Aug. 22 Daily.

Wyoming—State Hy. Comn., Cheyenne, grading 8.436 mi. Guernsey-Wheatland Rd., F.A.P. 205A, to Powers Constr. Co., Helena, Mont., $39,186.

Ont., East Windsor—Council, concrete paving ¼ mi. Wyandotte and Alice Sts., Meldrum Rd., 40 ft., to Canada Paving Corp., 30 Sandwich St., $38,310.

Ont., Fort Erie—Council, concrete paving ¼ mi. Niagara Blvd., 38 ft., to Brennan Paving Co., 400 Gage Ave. N., Hamilton, $33,958.

Ont., Hamilton—Grading 90,000 cu.yd., rein.-con. bridge on Longwood Rd. Extension, to E. P. Muntz Ltd., Temple Bldg., Toronto. Est. $56,950.

Ont., London—City Council, concrete paving Cheapside St., day labor. $40,000. W. P. Near, city engr.

Ont., Ottawa—To O'Leary Bros. Ltd., Bank Natl. Bldg., asphalt paving Argyle St., $26,092; Thomas St., $2,857; Somerset Street Bridge approaches, $34,750. Grand total $63,699.

Ont., Port Colborne—Asphalt and bituminous macadam paving Omar, King, Sugar Loaf and Welland Sts., to Dufferin Constr. Co. Ltd., foot of Bathurst St., Toronto. Est. $30,000.

Ont., Tillsonburg — Concrete paving 1 mi. roads, to King Eng. & Constr. Co., Oakville. Est. $30,000.

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

Calif., El Nido—El Nido Irrigation Dist. 12 mi. main canal, incl. 150,000 cu.yd. excav., 65,000 sq.ft. 2 in. concrete lining, 15 mi. laterals, incl. 120,000 cu.yd. excav., constructing 24- to 48-in. siphons with headwalls, bridges. A. Blakesley, c/o Mercedes Irrigation Dist., Mercedes, engr.

Calif., Linden—Linden Irrigation Dist., low diversion dam on Calaveras River, also small pumping plants. $100,000. F. H. Tibbetts, Alaska Comn. Bldg., San Francisco, engr.

Calif., Los Angeles — Bd. Supervs. Los Angeles Co. surveys to study ways and means to provide $500,000, piers, groynes, other protective work in connection with beach preservation. $500,000.

Ill., Carthage — Bd. Comrs. Hunt Drainage Dist. Hancock Co. filed petition asking authority to levy additional assessment $146,928, completing drainage work.

Ill., Havana—Liverpool Drainage Dist., Fulton Co., plans 8 mi. open ditches, 72,000 cu.yd. excav., 1 mi. tile ditches. $29,000. G. Ratclif, Liverpool, atty.

Ill., Lawrenceville—Surveys straightening 5 mi. Embarass River. State appropriated $69,000 for work. M. Bennsfield, Lawrenceville, engr.

Ill., Lewistown—Bd. Comrs. Liverpool Drainage & Levee Dist., Fulton Co., filed petition asking for authority to levy an additional assessment of $24,000, cleaning out ditches and constructing new open and tile ditches. C. H. Kreiling, dist. engr.

Ia., Cedar Rapids—City 639 ft. rein.-con. retaining wall on east bank Cedar River, 1st Ave. to 3rd Ave. S.E., incl. 7,700 cu.yd. excav., 7,000 ft. piling. $85,500. F. E. Young, City Hall, engr.

N. J., Bradley Beach—Bd. City Comrs., City Hall, 2 stone breakwater jetties, at North End. $25,000.

Oklahoma — Bd. Comrs. Caddo Co., Cordell, preliminary plans drainage ditch between Anadarko and Verden. $10,000. F. Ford, Cordell, engr.

Tex., Brownwood—Brown Co. Water Imprt. Dist. 1, bids latter part October, irrigation project for County, and impounding dam, 1,600 lin. ft., average height 85 ft., 8 mi. north of here, for City. $2,500,000. D. W. Ross, Brownwood, and Houston Bldg., San Antonio, engr. Noted Aug. 28.

BIDS ASKED

Calif., Turlock—Oct. 6, by A. Sorensen, secy. Turlock Irrigation Dist., 933,000 sq.ft. 2 in. concrete canal lining, 620 cu.yd. concrete in canal structures, 5,000 lin.ft. 30 in. and 36 in. diameter concrete pipe. R. V. Meikle, ch. engr. of district.

Mass., Cape Cod—Sept. 19, at Commissioners Office, Hyannis, ditching areas for mosquito control, in Cape Cod sections, part of $3,000,000 project for Cape Cod Mosquito Control Project. H. S. Dowden, secy.

Mass., Newbury — Sept. 26, by Dpt. Conservation, State House, Boston, constructing fish ways, Parker River in village Byfield, town of Newbury, incl. 5 natural type fishways, excavation, breaking, removing, handling and placing stone for walls and concrete flume. $15,000 or more. C. O. Bailey, comr.

Mass., Norfolk—Sept. 19, by Dpt. Correction, Commissioners Office, State Prison Colony, excavating 4,000 lin.ft., filling trench for 8 or 10 in. c.i. pipe, State Prison Colony.

Miss., Indianola — Sept. 26, by Bd. Comrs. Beaver Dam Drainage Dist., Sunflower Co., at office Moody & Johnson, Bank of Indianola Bldg., drainage work. $65,000. Former bids rejected. H. E. Stansel, Ruleville, engr.

CONTRACTS AWARDED

Ill., Beardstown—Sangamon Outlet Drainage Dist., outlet for Sangamon River, incl. 760,000 cu.yd. excav., near Chandlerville, also straightening, cleaning present channel, incl. 760,000 cu.yd. excav., to Gillen Dock Dredge & Constr. Co., Beardstown.

Ill., Gorham—Big Lake Special Drainage Dist., Jackson Co., 18,300 ft. ditchwork, incl. 42,000 cu.yd. excav., to D. B. Talbott, Murphysboro, at $0.15 per cu.yd. Noted Aug. 28.

Miss., Gulfport—Bd. Supervs. Harrison Co., 7,000 ft. concave rein.-con. slab or apron seawall with creosoted piling on Gulf Beach, to Stewart & Lewis, New Orleans, $103,322.

Wash., Everett—Bd. P. Wks., (1st unit) dredging, filling, riprapping east waterway, to Puget Sound Bridge & Dredging Co., Central Bldg., Seattle, for Everett Port Comn. $80,000. Noted June 10.

N. S., Sandford—Dpt. P. Wks., Ottawa, Ont., extending breakwater to J. W. and S. F. Comeau and E. J. Gaudet, Comeauville, $20,160.

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Excavation, Drainage, Irrigation, Levees, River and Harbor (Continued)

Ont., Hamilton — Dominion Govt., Ottawa, deepening, widening channel leading to wharf of By-Products Coke Ovens Ltd.; deepening basin at Steel Co. of Canadas Dock, to Cadwell Sand & Gravel Co. Ltd., Windsor, $94,778.

Public Bond Elections

Coming Bond Elections

Pumping Station, Filtration Plant, etc.—Wilmette, Ill., Nov. 4. $500,000.
Waterworks—Augusta, Kan., Sept. 23, $130,000.
Waterworks Impvts.—Colliersville, Tenn., Sept. 30, $30,000.
Schools — Colorado Springs, Colo., Nov. 18, $1,000,000.
Schools — St. Louis Park, Minn., Sept. 17, $250,000.

Bonds Voted

Waterworks Distribution System—Leoti, Kan., $35,000. C. A. Haskins, 822 Finance Bldg., Kansas City, Mo., Engr.
Waterworks—Hot Springs, Mont., $15,000. A. L. Jaqueth, Kalispell, Engr.
Waterworks Improvements — Mountain Grove, Mo., $20,000.
Waterworks Distribution Mains, Fire Equipment —Richland, Mo., $20,000.
Storage Reservoir, Repairing Filtration Plant—Holdenville, Okla., $225,000. W. R. Holway, 302 East 18th St., Tulsa, Engr.
Waterworks, Additions, Pumping and Filtration Plant—Lebanon, Tenn., $200,000. Wiberman & Singleton, Chandler Bldg., Atlanta, Ga., Engrs.
Sewage Disposal Plant — Spencerport, N. Y., $160,000. W. S. Lozier, 10 Gibbs St., Rochester, Engr.
Hydro-Electric Plant — Soda Springs, Idaho, $30,000.

FEDERAL GOVERNMENT

PROPOSED WORK

Calif., Sacramento — LEVEE — U. S. Eng., 8,700 lin.ft. levee in Feather River.

Calif., San Francisco—QUARTERS—Con. Q.M., 40 officers and non-commissioned officers quarters.

Calif., San Francisco—SEAWALL—Con. Q. M., Fort Mason, 500 ft. rein.-con. seawall.

Calif., San Francisco—TANK—Con. Q. M., Fort Mason, 50,000 gal. steel water tank with 55 ft. tower, at Fort Miley.

Ill., Grand Lake—REVETMENT—U. S. Eng., Custom House, St. Louis, Mo., soon takes bids 6,000 ft. revetment work in Mississippi River. Noted Sept. 4 under "Great Lake."

Ind., Warsaw—POST OFFICE—Treas. Dpt. at office Super. Archt., post office.

La., New Orleans — EARTHWORK — U. S. Eng., 744,000 cu.yd. earthwork in South Bank Red River Levees.

La., New Orleans—LEVEES—U. S. Eng., repairing 67,000 cu.yd. levees at Atchafalaya Fort, Lafourche and Pontchartain Levees.

Minn., Hastings — LOCKKEEPER'S DWELLING—U. S. Eng., St. Paul, lockkeeper's dwelling, garage and service building at Hastings Lock and Dam.

Pa., Phila.—DREDGING SLEEVES—U. S. Eng., 645 rubber dredging sleeves at U. S. Army Reservation, Fort Mifflin.

Tenn., Memphis—LEVEE—U. S. Eng., 684,200 cu.yd. levee, Upper and Lower St. Francis, Upper Yazoo and White River Levee Dists.

Texas—JETTY, etc.—U. S. Eng., Galveston, repairing west jetty, at Sabine Pass; placing 9,000 tons cap stone, 12,000 tons core stone and replacing 3,000 tons cap stones.

Tex., Texarkana—POST OFFICE—Treas. Dpt. at office Superv. Archt., post office.

BIDS ASKED

Conn., New London—PIERS—Spec. 6282—Oct. 8, by Yards & Docks, Navy Dpt., removing piers, and building 4 new timber piers, on same sites, at Naval Submarine Base; adv. E. N.-R. Sept. 18. Noted Sept. 11.

D. C., Wash.—STRUCTURAL STEEL—Sept. 26, by A. L. Flint, genl. purch. agt. Panama Canal, structural steel, plate steel, duplex pump, ring bolts, turnbuckles, etc., Schedule 2589.

Ia., Iowa City—POST OFFICE—Oct. 10, by Treas. Dpt. at office Sup. Archt., remodeling, extending U. S. Post Office.

La., New Orleans—EARTHWORK—Sept. 29, by U. S. Eng., 744,000 cu.yd. earthwork in South Bank Red River Levees, 2nd New Orleans Dist. Noted Sept. 18.

Mississippi — LEVEE — Sept. 23, by U. S. Eng., P. O. Box 667, Vicksburg, restoring, repairing, discing and dressing 156 stations of levee on left bank Mississippi River.

O., Toledo—COURT HOUSE, etc.—Oct. 13, by Treas. Dpt. at office Sup. Archt., constructing U. S. Court House, Custom House, etc.; adv. E. N.-R. Sept. 18.

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Pa., Pittsburgh—CORE BORINGS—Treas. Dpt. at office Sup. Archt., taking bids core borings for Federal Building, Grant and 7th Sts. Trowbridge & Livingstone, 527 5th Ave., New York, archts. Noted Jan. 31, 1929.

Tex., Randolph Field — QUARTERS, COLD STORAGE PLANT, etc.—Con. Q. M., bids about Sept. 25, two 2 story, basement, rein.-con., tile bachelor officers' quarters, Jobs 1 and 2, W. E. Simpson Co., 942 Milam Bldg., and Phelps & De Wees, Gunter Bldg., San Antonio, engrs.: 1 story, post exchange plant, incl. cold storage plant, stores, garage, Matthews-Kenan, Smith-Young Tower, San Antonio, engrs., R. B. Kelly, 336 Milam Bldg., San Antonio, archt.

Tex., Randolph Field—SEWERAGE SYSTEM —Sept. 22, by Con. Q.M. storm sewerage system for Randolph Field. Former bids rejected. Noted Sept. 4 Daily.

Utah—Fort Douglas—OFFICERS QUARTERS —Con. Q.M., Sept. 3, 6 commissioned officers quarters, from Bernstein Bros., Salt Lake City, $71,148. Noted Aug. 14.

Utah, Ogden—POST OFFICE—Oct. 22, by Treas. Dpt. at office Sup. Archt., extending, remodeling U. S. Post Office and Court House; adv. E. N.-R. Sept. 18. Noted June 5.

Va., Fort Monroe—APARTMENTS—Oct. 10, by Con. Q. M., three 4-family, brick, tile apartment houses; adv. E. N.-R. Sept. 18.

Va., Quantico—BARRACKS—Spec. 6230—Oct. 1, by Yards & Docks, Navy Dpt., four 3 story, barracks, incl. plumbing, heating, sewerage, drainage, electric and power systems, telephone conduits, concrete and bituminous paving at U. S. Marine Barracks; adv. E. N.-R. Sept. 18. Noted Sept. 4.

T. H., Pearl Harbor — REFRIGERATING PLANT — Spec. 6005 — Nov. 5, by Yards & Docks, Navy Dpt., refrigerating plant at Naval Operating Base.

CONTRACTS AWARDED

Ala., Maxwell Field (mail Montgomery) — SCHOOL—Con. Q. M., air corps tactical school, to Samford Bros., Montgomery, $119,273. Noted June 26.

Calif., San Diego—PIER—Spec. 6239—Yards Docks, Navy Dpt., extending station pier, to M. H. Golden, San Diego, Calif., $101,000. Noted Aug. 21.

D. C., Wash.—FENDERS—Executive Officer, Arlington Memorial Bridge Comn., Navy Bldg., fenders for bascule draw span of Arlington Memorial Bridge, to Triest & Earle, Real Estate Trust Bldg., Phila., Pa., $39,740 plus $6,320 for creosoted timbers. Noted July 10.

D. C., Wash.—RIP RAP STONE—U. S. Eng., 24,000 tons rip rap stone in Anacostia River, to Columbia Sand & Gravel Co., 3036 K St. N. W., $59,520.

Fla., Cedar Keys—DREDGING—U. S. Eng., Jacksonville, 15,300 cu.yd. in Cedar Keys Harbor, to Shell Producers Co., Tampa, $37,179. Noted June 26.

Illinois—LEVEES—U. S. Eng. Office, 428 Custom House, St. Louis, Mo., placing 470,000 cu.yd. earthwork in Clear Creek, Levee and Drainage Dist. of Union and Alexander Counties, to Mathews Bros. Constr. Co., Erie, $69,936. Noted Aug. 7.

Kan., Fort Leavenworth—APARTMENTS— Con. Q. M., remodeling Buildings 218, 219 and 233, and 2 apartments, to J. G. Barnes, Leavenworth, $101,640.

La., Alexandria—WELL—Vet. Bur., drilling, testing, finishing deep well, to T. B. White Drilling Co., Alexandria, $5,750.

Md., Fort George Meade—ROADS—Con. Q.M., constructing roads to H. L. Maas & Sons, 1119 Ensor St., Baltimore, $34,800.

Michigan—DREDGING—U. S. Eng., Detroit, 2,161,800 cu.yd. St. Mary's River, to Great Lakes Dredge & Dock Co., 104 South Michigan Ave., Chicago, Ill., $510,476. Noted July 31.

Missouri—LEVEE—U. S. Eng., Rock Island, Ill., enlarging Marion Co. Drainage Dist., 175,000 cu.yd. Fabius River Sect., to W. M. O'Meara, 308 W.C.U. Bldg., Quincy, Ill., $27,825; 145,000 cu.yd. in Mississippi and North River Sects., to W. P. Carolan & Co., Inc., 444 Oakwood Ave., Highland Park, $23,403. Noted Aug. 21.

Mo., Baders Front — DIKE — U. S. Eng., Memphis, Tenn., 850 ft. permeable crib dikes in Mississippi River, to Woods Bros. Constr. Co., 132 South 13th St., Lincoln, Neb., $51,670. Noted Aug. 14.

Mo., St. Louis—PUMP—U. S. Eng., 428 Custom House, dredging pump for U. S. Dredge Fort Chartress, to Fulton Iron Wks., 1259 Delaware Ave., $8,935. Noted Aug. 28.

N. J., Fort Monmouth—QUARTERS—Con. Q.M., three 4 family apartments, 1 batchelor officers quarters, to J. M. Kismer & Bro. Lumber Co., Fairmount, W. Va., $207,980. Noted July 31.

N. J., Red Bank—POST OFFICE— Treas. Dpt. at office Sup. Archt., 1 story, basement, brick, steel, to Lordi & Oltiere, 36 East 208th St., New York, $105,885. Noted July 24.

N. Y., Brooklyn—ELEVATORS—Spec. 6229 —Yards & Docks, Navy Dpt., repairing elevators, to Otis Elevator Co., 810 18th St., Wash., D. C., $16,340.

N. C., Wilmington—DREDGE—U. S. Eng., 1 dredge pump for pipe line dredge "Henry Beacon," to Ellicott Machine Corp., Bush and Severence Sts., Baltimore, Md., $4,248.

South Dakota—ROAD—A. E. Palen, Custom House Bldg., Denver, Colo., surfacing 1 mi. North and South Hy., Wind Cave Natl. Park Project, to Northwestern Eng. Co., Rapid City, $13,815.

Va., Hampton Roads—IMPROVEMENTS— Spec. 6270—Yards & Docks, Navy Dpt., improving flying field, to E. P. Lindsay, 312 King St., Portsmouth, $38,833.

Wash., Fort Lewis—QUARTERS—Con. Q.M., 5 field officers and 13 company officers quarters, to W. T. Post, 4720 Pacific Ave., Tacoma, $205,900. Noted July 31.

Wyoming — ROAD — Bu. P. Rds., Denver, Colo., graveling 4.307 mi. Cody-Yellowstone Rd., Sect. F, Forest Hy. Project, Park Co., to Taggart Constr. Co., Cody, $88,654. Noted July 31.

FEDERAL POWER COMMISSION

Applications for License and Permits Licenses

1108—W. J. Sweet, M. W. Ray, J. E. Flurry and A. L. Houghtaling, Bridge, Ore., wants preliminary permit power project partly within Umpqua National Forest and partly on public lands on Rock Creek and tributaries in Coos Co.

1109—Southern Sierras Power Co., Riverside, Calif., wants license transmission line partly on public lands in Imperial and Riverside Counties.

1110—South Branch Power Co., Phila., Pa., wants preliminary permit power project on south branch of Potomac and Cacapon Rivers in Morgan, Hampshire, Grand and Hardy Counties, W. Va.

1111—Montana Power Co., Butte, Mont., wants license partly constructed transmission line partly on public lands and partly on lands of Flathead Indian Reservation, Lake and Sanders Counties.

1112—Southern California Edison Co. Ltd., 306 West 3rd St., Los Angeles, Calif., wants license transmission line partly within Angeles Natl. Forest, Los Angeles Co.

1113—Pub. Serv. Co. of Colorado, 15th and Champa Sts., Denver, Colo., wants license transmission line within Colorado Natl. Forest, Boulder Co.

RAILWAYS

PROPOSED WORK

Colorado—New Mexico Lumber Co., McPhee, c/o J. Zallaha, mgr., on site, 15 mi. narrow gage track from McPhee down Dolores River. $200,000.

BIDS ASKED

Indiana—See "Contracts Awarded."

New York—Oct. 2, by Div. Standards & Purchase, Capitol, Albany, new trestle and spur track at New York State Hospital for Treatment Incipient Pulmonary Tuberculosis, F. W. Morris, supt.; adv. E. N.-R. Sept. 18.

CONTRACTS AWARDED

Indiana — Indianapolis Union Ry. Co., Indianapolis, T. R. Ratcliffe, ch. engr., 2 story interlocking plant to handle switches, signals, near Union Station at Indianapolis, own forces. $375,000.

Nevada—Union Pacific R.R., H. C. Mann, ch. engr., Omaha, Neb., grading, trestles, culverts 22 mi. branch railroad from Las Vegas to Summit, to Merritt-Chapman & Scott Corp., P. O. Box 507, San Pedro, Calif. Noted Sept. 4.

Ontario—Toronto Hamilton & Buffalo Ry., R. L. Latham, ch. engr., Hamilton, preliminary plans raising tracks 7 ft. through several streets, also construct 10 story station in Hamilton. $1,250,000. O. S. Paysant of Fellheimer & Wagner, 155 East 42nd St., New York, engr. on part of plans.

SUBWAYS AND TUNNELS

PROPOSED WORK

Calif., Stockton—City Charter Way Subway, $200,000. Cost to be borne by City, Southern Pacific R.R. Co., 65 Market St., San Francisco, G. W. Boschke, ch. engr., and Western Pacific R.R. Co., Mills Bldg., San Francisco, J. W. Williams, ch. engr.

BIDS ASKED

Ont., Walkerville — City Council bids about Oct. 1, subway under Pere Marquette Ry. tracks, Wyandotte St. $170,000. H. W. Patterson, city engr.

CONTRACTS AWARDED

Pa., Phila.—Dpt. City Transit, C. E. Myers, dir., City Hall Annex, 1st section Market St. Subway, to Dravo Contg. Co., Neville Island, Pittsburgh, $3,692,635. Noted Aug. 14.

GRADE CROSSINGS

PROPOSED WORK

N. Y., Colden—Buffalo, Rochester & Pittsburgh R.R., E. F. Robinson, ch. engr., Rochester, reconstructing hy. bridge carrying Boston-Golden County Hy. over railroad tracks, Erie Co. $67,500.

N. Y., New Castle—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, grade crossing on Echo-Lake-Pines Bridge Co. Hy., Westchester Co. $85,500.

Grade Crossings (Continued)

N. Y., Veteran—Pennsylvania R.R. Co., T. J. Skillman, ch. engr., Broad St. Sta., Phila., Pa., eliminating Halls Crossing, $54,800; and crossing 2 mi. north Pine Station on Horseheads-Montour Falls Rd., Chemung Co., $53,800.

Pa., Fredonia—Bessemer & Lake Erie R.R., H. T. Porter, ch. engr., Greenville, eliminating grade crossing over 2 main tracks on State Hy. Route 213, near Cool Spring Station and near here. $140,000.

Pa., Washington—Pittsburgh & West Virginia R.R., H. H. Temple, ch. engr., Wabash Bldg., Pittsburgh, reconstructing subway, 32 ft. wide, 13 ft. clearance, under tracks on Bridgeville-Avella Hy., Washington Co. $139,499.

BIDS ASKED

Ont., Oshawa — Canadian Natl. Railways, Union Sta., Toronto, bids about November, grade separation and subway, Simcoe St. S., for City. $250,000. T. T. Irving, Union Sta., Toronto, engr.

CONTRACTS AWARDED

N. Y., Cheektowaga—Delaware, Lackawanna & Western R.R. Co., G. J. Ray, ch. engr., Hoboken, N. J., Erie R.R. Co., G. S. Fanning, ch. engr., 50 Church St., New York, and Lehigh Valley R.R. Co., G. T. Hand, ch. engr., 143 Liberty St., New York, eliminating Ely or Indian Rd. Crossing, the Bway., the Dick Ave. or School House Rd. and Williamsville Crossings, Depew, Erie Co., to Liberto & Cerullo, Inc., Depew, $71,181.

DAMS

PROPOSED WORK

Calif., Linden—See "Excavation, Drainage, Irrigation, Levees, Rivers and Harbors."

Calif., San Jose—See "Waterworks."

PIERS AND WHARVES

PROPOSED WORK

Cae'if., Los Ange'es—See "Excavation, Drainage, Irrigation, Levees, River and Harbors."

BIDS ASKED

Mass., Falmouth—P. E. Hall, taking bids pile, timber pier, fill solid. $25,000. Private plans.

CONTRACTS AWARDED

B. C., North Vancouver — WHARF — See "Factories and Mills."

Ont., Kingsville—Dpt. P. Wks., Ottawa, repairing East Pier, to Canada Paving & Supply Co. Ltd., East Windsor, $24,583.

Ont., Kincardine—N. Desjardins, secy. Dpt. P. Wks., Ottawa, reconstructing North Pier, 200 ft. high, to E. A. Henry & D. G. Ross, Kincardine, $27,606. Noted July 31.

AIRPORTS

PROPOSED WORK

Conn., New Haven — New Haven Airport, Morris Cove, plans by Leo F. Caproni & Co., 1044 Chapel St., 1 story, 80 x 100 ft., 20 x 100 ft., and 20 x 50 ft., concrete, steel hangars with double leanto, Morris Cove. $40,000.

N. J., Newark—National Air Transport, 420 Lexington Ave., New York, hangar, shops, Municipal Airport. $100,000. R. H. Higgins, c/o owner, and 5936 South Cicero Ave., Chicago, Ill., engr.

BIDS ASKED

Conn., East Hartford (br. Hartford)—Pratt & Whitney Aircraft Corp., 450 Capitol Ave., Hartford, and Chance Vought Corp., 120 Bway., New York, taking bids 2 hangars, developing 165 acres for airport. To exceed $40,000. Austin Co., 120 Bway., New York, engrs. Noted Aug. 28.

POWER AND LIGHTING

PROPOSED WORK

Calif., Woodland — City underground wiring system $50,000 or more.

N. J., New Brunswick—Bd. City Comrs., installing traffic lighting system. $25,000. A. Atkinson, city engr.

CONTRACTS AWARDED

Calif., Riverside—See "Streets and Roads."

SPORTS AND PARKS

PROPOSED WORK

Ia., Cedar Rapids—Preliminary plans municipal swimming pool $40,000.

N. J., North Plainfield—Boro Council, Boro Hall, laying out and equipping playground, Green Brook near Madison Ave. $25,000. C. H. Firstbrook, 240 West Front St., Plainfield, boro engr.

N. J., Weehawken—Twp. Comn., Municipal Bldg., rejected bids Sept. 3, retaining walls, grading playground at Park Ave. $25,000. A. Angelicola, Municipal Bldg., engr. Noted Aug. 29 Daily.

N. Y., Brooklyn—Ice Palace Corp., 393 7th Ave., New York, plans by E. C. Horn & Son, 1476 Bway., New York, ice skating pavilion, 588 Flatbush Ave. $275,000. M. R. Carpenter, 176 West Adams St., Chicago, Ill., engr.

N. Y., New York—Beth Israel Hospital, 60 Jefferson St., sketches by H. Hurwitt, 41 West 33rd St., swimming pool, elevators and stairways in 6 story, 78 x 210 ft. hospital, 60 Jefferson St. $150,000.

O., Oxford—See "Schools."

B. C., Vancouver—Vancouver Olympic Assn., L. M. Diether, chn., 1669 West 29th St., large stadium.

BIDS ASKED

Mass., Boston—Sept. 25, by Park Dpt., 33 Beacon St., improving Franklin Park, incl. rock garden. $25,000. Noted Aug. 21.

O., Cleveland—City, D. E. Morgan, city mgr., bids about Oct. 1, superstructure brick, rein.-con. stadium, Lakefront. $750,000. Osborn Eng. Co., 7016 Euclid Ave., engrs.

CONTRACTS AWARDED

D. C., Wash.—District Comrs., constructing part Meridian Hill Park development program, 16th St. and Florida Ave., to F. Drew Co., 2525 Pennsylvania Ave. N. W., $89,789.

Ill., Salem — City Council, William Jennings Bryan Memorial Pool, 80 x 200 ft., concrete, with white facing, brick, concrete bath house with 39 dressing booths for women, 53 for men, with showers, toilets, filter plant and vacuum cleaner equipment, to W. F. Sell, Pana, $25,203.

N. J., Perth Amboy—City Comn., bleachers, grandstands, to M. J. Dinesen, Perth Amboy, $11,810. Noted Aug. 18 Daily.

Okla., Bartlesville—City, c/o W. N. Trautman, park supt., 70 x 220 ft. rein.-con. grandstand, 2,000 seating capacity, incl. dressing rooms, showers, to Hamilton Constr. Co., Bartlesville, $36,000. Noted Aug. 15.

Ont., Kapuskasing—G. R. Gouinlock, archt., 371 Bay St., Toronto, general contract 1 story, basement, 33 x 175 ft. curling rink, 117 x 223 ft. skating rink, steel timber, concrete founds., to W. J. Trick Constr. Co., 25 Albert St., Oshawa, for Spruce Falls Power & Paper Co. Total est. $30,000. Noted June 12.

HEATING AND VENTILATING

BIDS ASKED

N. Y., Utica—Oct. 1, by Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, heating work for stoker fan and turbine boiler feed pump, Utica State Hospital; adv. E. N.-R. Sept. 18.

CONTRACTS AWARDED

Conn., Stamford—Theatre Realty Co., Stamford, heating, plumbing in theatre, office and store building, South and Main Sts., to Richard & Jessup, 27 Summer St.; electrical work, to Industrial Electric Co., 124 North 63rd St., Phila., Pa. Est. exceeds $25,000. Noted Apr. 10 under "Theatres."

Mass., Malden (br. Boston) — Malden Hospital, E. P. Bliss, chn. Comrs., heating and ventilating in hospital addition, to Scofield-Campbell Co., 41 Haverhill St., Boston; plumbing, to H. J. Lyons Co., 25 D St., South Boston; electrical work, to B. H. Pierce, 664 Salem St., Malden. Est. exceed $75,000. Noted Sept. 11 under "Hospitals."

Mass., New Bedford—City, E. B. Hammond, chn. com., heating and ventilating in Vocational School for Girls, Hillman St., to Osberg & Knowlton, 219 Main St., Fairhaven, $40,576; plumbing, to W. Hamel, 915 Acushnet Ave., $12,446; electrical work, to Kenworthy & Taylor, 407 Bway., Everett, $10,917. Grand total $68,939. Noted Sept. 11 under "Schools."

Mass., Somerville (br. Boston)—City, School Comn., heating, ventilating in Southern Jr. High School, Vinald Ave., to J. S. Cassedy, 133 Austin St., Cambridge. Est. exceeds $25,000. Noted Aug. 21 under "Schools."

UNCLASSIFIED

PROPOSED WORK

Mass., Boston—WALL, etc.—Suffolk Co., J. A. Kelliher sheriff, rebuilding wall, constructing tunnel at Charles St. Jail. $25,000 or more. Desmond & Lord, 1 Beacon St., archts.

N. J., Hillsdale—TUNNELS—Dpt. Institutions & Agencies, State Office Bldg., Trenton, concrete, rein.-con. tunnels for connecting buildings at Hillsdale State Hospital. $25,000. Plans recalled, indefinitely when new bids are taken, C. N. Leathem, Jr., Trenton, state archt. Noted Aug. 28.

N. J., South Amboy—DOCKS, etc.— Sun Oil Co., 420 Lexington Ave., New York, timber and concrete docks, terminal. $25,000 or more. Private plans.

N. Y., Brooklyn—ELEVATORS—Dpt. Hospitals, Municipal Bldg., New York, plans by Otis Elevator Co., 130 Clinton St., elevator shafts for Kings Co. Hospital, Clarkson and New York Aves. $170,000.

N. Y., Middle Village—RECEIVING VAULT—St. Johns Cemetery, Metropolitan Ave. and Woodhaven Blvd., 20 x 46 ft. receiving vault. $50,000.

Tex., McAllen — LAND DEVELOPMENT — W. D. Holterman, Lincoln Hy., Ft. Wayne, Ind., and McAllen, acquired 88 acre tract land adjacent to here and plans developing same. Private plans.

Utah, Salt Lake City—RADIO STATION—KSL Radio Station, Vermont Bldg., enlarging station from 5,000 to 50,000 watts. Scheduled. E. J. Glade, managing dir.

BIDS ASKED

Mass., Malden (br. Boston)—COMFORT STATION—Sept. 22 (extended dates, by City, F. J. Walsh, City Hall, and C. F. Springfield, archt., 50 Park St., 1 story, brick, concrete, steel comfort station, Huntings Field. $25,000. Noted Sept. 11.

N. J., New Brunswick—RADIO STATION—C. MacKenzie, archt., 119 Broad St., New York, bids about Oct. 15, general contract brick radio station, Easton Ave., for Radio Corp. of America, 66 Broad St., New York. $2,000,000. Noted Mar. 13.

N. Y., Newark—TUNNELS—Oct. 1, by Commissioner Dpt. Hygiene, State Office Bldg., Albany, constructing and heating work to service connections (tunnels) and additional boiler capacity at Newark State School; adv. E. N.-R. Sept. 18.

N. Y., Syracuse—FIRE SPRINKLERS—Oct. 1, by Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, automatic fire sprinklers at Syracuse State School; adv. E. N.-R. Sept. 18.

CONTRACTS AWARDED

California — GAS PIPE LINE — Southern Counties Gas Co., 810 South Flower St., Los Angeles, 32.5 mi. 16 in. gas pipe line from Elwood field to Ventura, to Lang Transportation Co., 5501 Santa Fe Ave., Los Angeles. $600,000.

Ky., Louisville—GRAIN ELEVATOR—Ballard & Ballard Co., F. Borries, vice pres., 912 East Bway., 60 x 165 ft. grain elevator, 100 ft. high, 715,000 bu. capacity, 21 circular tanks of 17 ft. diam., 46 interstice bins, various sizes, also 2,500 bu. per hr. dryers, elevating and conveying machinery, Barret Ave. near Bway., to Jones Hettelsafer Co., 600 Mutual Bldg., Kansas City, Mo., $250,000.

Mass., Salem — COAL HANDLING PLANT, etc.—Salem Electric Lighting Co., 205 Washington St., coal handling plant and equipment, 25 Peabody St., to G. P. Carver, Inc., 40 Central St., Boston. Est. $25,000.

N. J., Camden—BULKHEAD SHED—Southern Jersey Port Comn., U. S. Jeffreys secy., 1 story, steel, sheet metal bulkhead shed to Robbins Contg. Co., Inc., 1139 North Front St., Phila., Pa., $146,262. Noted Aug. 7.

N. Y., Brooklyn — PICKET FENCE — Dpt. Hospitals, Municipal Bldg., New York, iron picket fence at Kings County Hospital, to P. J. Hand Co., Inc., 510 Smith St., $33,000.

Oregon—PIPE—Natural Gas Corp. of Oregon c/o Starr, Theo & Anderson, engrs., Sharon Bldg., San Francisco, Calif., furnishing 167 mi. 4- to 10-in. steel pipe (oxy-acetylene welded) for gas pipe line to serve cities of Klamath Falls, Bend, The Dalles, Hood River, La Grande, Baden and Coquille, to Hutchinson Co., 1450 Harrison St., Oakland, Calif., constructing pipe line, to Crane Co., 2nd and Brannan St., San Francisco, Calif.

Texas—GAS PIPE LINE—United Gas Co., Austin and San Antonio, 40 mi. 12 in. c.i. welded natural gas pipe line between San Marcos to Converse, to Texas Constr. Co., Deepwater, Houston, and Galveston, $115,000.

Tex., Laredo — SMELTING PLANT — Texas Mining & Smelting Co., c/o H. P. Henderson, pres., 522 5th Ave., New York, and Box 1070, 110 x 140 ft. plant, to Alamo Iron Wks., 130 Santa Clara St., San Antonio; steel, to Truscon Steel Co., Builders Exch. Bldg., San Antonio, Tex., and Youngstown, O. Total est. $150,000. Noted Aug. 28.

MATERIALS

BIDS ASKED

CEMENT, etc.—Los Angeles, Calif.—Bd. Comrs., Los Angeles Co., taking bids 785 bbl. portland cement (in sacks) f.o.b. Glendora and 3,800 bbl. (in sacks f.o.b. Azusa, for Little Dalton Wash Storm Drain; 6,250 lb. ½ in., 100 lb. ⅝ in., 211,700 lb. ¾ in., 57,600 lb. ⅞ in. square deformed reinforcing steel and 100 lb. square deformed reinforcing steel, delivered Azusa; 1,180 lb. ½ in., 11,525 lb. ⅝ in., 46,625 lb. ¾ in., 10,370 lb. ⅞ in. square deformed reinforcing steel and 100 lb. square deformed reinforcing steel, delivered at Glendora, for Little Dalton Wash Storm Drain.

TRANSFORMERS—Los Angeles, Calif.—Sept. 23, by T. Oughton, city purch. agt., six 20 kw., two 25 kw. and ten 30 kw. subway type transformers.

FUEL OIL — **Boston, Mass.** — Sept. 23, by Supply Dpt., P. A. Chapman, supt., furnishing and delivering light and heavy fuel oil to various departments, from Oct. 1, 1930 to Sept. 1, 1931, as required. Est. exceeds $5,000.

WOOD PLANKS—**Cleveland, O.**—Sept. 20, by Bd. Comrs. Cuyahoga Co., furnishing 20,000 ft. wood planks for bridges.

CONTRACTS AWARDED

ASPHALT OIL—**New Brunswick, N. J.**—Bd. Freeholders Middlesex Co., Court House, 60,000 gal. N.A. 4, asphaltic oil and 6,500 gal. R.C.O. oil, to W. F. Hackins, 102 Hamilton St., at $0.19 per gal. and $0.16 per gal. respectively. Noted Aug. 28.

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EQUIPMENT

BIDS ASKED

BOILERS—**Boston, Mass.**—Sept. 24, by Dpt. P. Buildings, J. P. Englert, supt., furnishing 2 horizontal boilers for Suffolk Co. Courthouse, Pemberton Sq. $5,000.

TRUCKS—**Minneapolis, Minn.**—Sept. 22, by F. S. Gram, city purch. agent, two 1 ton trucks for Bd. Educ.

FOREIGN

France, Rouen — Standard Oil Co. of New Jersey, 26 Bway., New York, taking bids through French subsidiary for refinery $8,000,000.

Buildings

RESIDENTIAL

BIDS ASKED

Ia., Davenport—See "Theatres."

Mass., Falmouth Heights—G. B. Moran, 16 Garden St., Cambridge, soon takes bids on revised plans hotel, Grande Ave., $300,000, Silverman & Brown, 51 Cornhill, Boston, archts.

Mo., St. Louis—See "Contracts Awarded."

N. J., Camden—Kaplan & Miller, Broad and Chestnut Sts., Phila., Pa., taking bids 4 story, basement, 100 x 286 ft., brick, steel, rein.-con., Park Blvd. and Bradley Ave. $300,000. H. H. Klinge, 709 Chestnut St., Phila., Pa., archt.

N. J., Newark—F. Grad, archt., 1023 Broad St., taking bids general contract 12 story, basement, 100 x 120 ft., brick, steel, South 13th St. and Clinton Ave., for Owner, c/o architect. $350,000. Noted July 24.

N. M., Cloves—Sept. 29, by Southern Natl. Hotel Corp., c/o Franklin Canaday, Galveston, Tex., and Wyatt C. Hedrick, Inc., archts., Ft. Worth and Galveston, Tex., rein.-con., brick, tile hotel, plain found. $25,000.

N. Y., Brooklyn—R. A. Connolly, 726 Ocean Ave., bids on separate contracts 6 story, 56 x 65 ft., Dorchester Rd. and 18th St. $150,000. W. T. McCarthy, 147 Pierrepont St., archt.

N. Y., Brooklyn—See "Contracts Awarded."

N. Y., New York—See "Contracts Awarded."

N. Y., New York—Corporation, c/o S. Friedman, 15 West 47th St., taking bids on separate contracts 28 story office, stores, 90 John St. and 24 Gold St. $2,000,000. Springsteen & Goldhammer, 40 East 49th St., archts. Noted Sept. 11.

N. Y., New York—Jarmars Realty Co., S. Fischer, pres., 209 West 145th St., taking bids on separate contracts 6 story, 84 x 130 ft. apartments, 66 St. Nicholas Pl. $400,000. H. Ginsberg, 205 East 42nd St., archt.

Wash., Seattle—Housing Corp., c/o Bain & Pries, archts., Liggett Bldg., bids about Sept. 23, 4 story, basement, 160 x 180 ft., brick, cast stone, L-shaped apartment, garage, Bellevue Ave. N. and Roy St. $160,000.

CONTRACTS AWARDED

Calif., Los Angeles — E. A. Kassing, 1745 North Gramercey Pl., 7 story, basement, 88 x 166 ft., rein.-con. apartment building, to A. J. Showalter, 1354 North Harper Ave., $200,000.

Ill., Chicago—B. F. Meyer, 304 South Dearborn St., general contract 5 story, 81 x 171 ft., rein.-con., brick hotel, stores, to Henke Constr. Co., 609 North Wells St. Est. $500,000. Noted Jan. 2.

Ind., Gary—L. M. Johanson, 5941 Aberdeen Ave., Chicago, Ill., 4 story, basement, 130 x 150 ft., brick, steel, Virginia Ave. and Ridge Rd., separate contracts. $200,000. S. G. Sevich, Gary, archt.

Mass., Peabody — Penn Realty Trust, c/o J. H. Bickford & Son Corp., archts., 6 Beacon St., Boston, 3 story, basement, brick, stone, steel, irregular sized, plain found., 115 Lowell St., to E. S. Butterfield Co., 88 Broad St., Boston. Est. $150,000.

Mo., St. Louis—Alco Investment Co., c/o V. A. Chinberg, 808 Chestnut St., 3 story, basement, 106 x 175 ft., brick, terra cotta, concrete, incl. garage, Clara and Clemens Sts., separate contracts, $175,000. Nolte & Naumann, 3832 West Pine Blvd., archts.

N. J., Morristown—Robert Wylie Co., c/o Mann & MacNeille, archts., 70 East 45th St., New York, general contract three 3 story, basement, brick, steel, Normandy Parkway, to Walter Kidde & Co., 140 Cedar St., New York. Est. $150,000. Contractor takes sub-bids in late fall.

N. Y., Brooklyn—B. and H. Building Corp., S. Borden, pres., 6 story, 126 x 140 ft., Ocean Ave. and Avenue R, separate contracts, $400,000. M. A. Cantor, 124 Livingston St., archt.

N. Y., Brooklyn — R. L. Goetz, Inc., 153 Pierrepont St., 6 story, 69 x 112 ft. Marine Ave. and Ridge Blvd., separate contracts, $150,000. Seelig & Finkelstein, 153 Pierrepont St., archts.

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N. Y., Brooklyn — One Hundred Thirty-One Lincoln Rd., Inc., S. J. Kellner, pres., 66 Court St., 6 story, 75 x 177 ft., Lincoln Rd. and Bedford Ave., separate contracts. $225,000. Cohn Bros., 361 Stone Ave., archts.

N. Y., New York—One Hundred Thirty East 50th Street, Inc., 232 Madison Ave., N. Wilson, pres., 12 story, 85 x 130 ft., 317 East 50th St., separate contracts. $600,000. G. G. Miller 545 5th Ave., archt.

N. Y., New York—H. K. Ferguson, 25 West 34th St., 35 story hotel, apartments, Central Park S., separate contracts. To exceed $3,000,000. Bids later. Private plans.

N. Y., New York — Forty West 86th Street Realty Corp., M. Barkin, pres., 42 West 48th St., apartments, 40-44 West 86th St., separate contracts. $800,000. J. M. Felson, 250 West 57th St., archts.

N. Y., Yonkers—Winston Ownership, Inc., 565 5th Ave., 6 story, 55 x 143 ft., Gramatan Ave., separate contracts. $175,000. E. S. Turner, 132 Lincoln Ave., Tuckahoe, archt.

CLUBS

PROPOSED WORK

La., New Orleans — Y. W. C. A., 129 East 52nd St., New York, soon takes bids general contract, club, $300,000. Favrot & Livaudais, Hibernia Bank Bldg., archts. Noted June 5.

N. J., Weehawken—B. P. O. E., 2 6th St., revised sketches by W. Mahnken, 1401 32nd St., Union City, 3 story, basement, brick, steel club house addition, Boulevard E. and 6th St. $150,000. F. J. Ricker, 685 Hudon Ave., West New York, assoc. archt. Noted May 15.

Nev., Reno—Scottish Rite, Knights Templar, and Blue Lodge, plans by C. Werner & S. Heinman, 605 Market St., San Francisco, Calif., auditorium, $500,000. Noted Apr. 10.

N. Y., New York—Beach Realty Corp., J. A. Murphy, pres., 7 West 170th St., 3 story, 91 x 195 ft. club and locker rooms, 177th St. and Longstreet Ave. $350,000. J. J. Dunnigan, 2382 Grand Concourse, archt. **Maturity after Dec. 1.** Noted July 3.

N. Y., New York—Cosmopolitan Club, 133 East 40th St., 52 x 100 ft. club, 122 East 66th St. To exceed $200,000. **Maturity in spring.** Noted July 3.

O., Cincinnati—J. C. Grunkemeyer, archt., 3717 Easton Ave., soon lets contract, 2 story basement, 100 x 200 ft. brick, stone, stucco, plain found., Madisonville Rd., for Kenwood Country Club, E. Hoff, 8th and Race Sts. $150,000. Noted July 24.

BIDS ASKED

Conn., New Haven—Sept. 20, by Quinnipeak Club, A. S. Brooks, chn. Building Comn., 5 story, basement, brick, stone, 65 x 125 ft., plain found., Church St. Est. exceeds $150,000. D. Orr, 956 Chapel St., archt. Noted Sept. 4.

CONTRACTS AWARDED

O., Cincinnati—Friars Club, 1610 Vine St., 2 story, basement, 142 x 149 ft., rein.-con., brick club house and athletic building, McMillan St., to Leibold-Farrell Co., Schmidt Bldg., $400,000.

HOSPITALS

PROPOSED WORK

Calif., San Francisco—City and San Francisco Co. plans by Coffey & Rist, Phelan Bldg., brick ward addition on roof present building, Potrero Ave. $160,000.

Ind., Indianapolis—Bd. Comrs. Marion Co., H. Dunn, aud., plans by D. Graham, 1033 Architects Bldg., four 31 x 145 ft. and two 48 x 48 ft. rein.-con., brick, hollow tile buildings, west of city, north of speedway. $200,000.

Ind., South Bend—Bd. Comrs. St. Joseph Co., plans by Austin & Shambleau, South Bend, brick, rein.-con., hollow tile hospital. $150,000.

Kan., El Dorado—S. B. Allen Memorial Hospital Assn., L. D. Hadley, secy., bids early in October, 3 story, basement, 42 x 132 ft., rein.-con., brick, cut stone, Atchison St. and West Central Ave. $150,000. Washburn & Stookey, 222½ South Main St., Ottawa, archts. Noted July 24.

Mass., Barnstable—Cape Cod Hospital, Inc., C. L. Ayling, Hyannis, sketches by Shepard & Stearns, 53 State St., Boston, brick, steel addition, Park St. $150,000.

Mass., Boston—New England Medical Center, J. A. Cousen, pres., Tufts College, soon takes bids Tufts Teaching Clinic, Nurses' Home and Laboratory, 5 story, basement, 50 x 150 ft., brick, steel, plain founds., Bennet St. corner Ash St. To exceed $150,000. Andrews, Jones, Biscoe & Whittemore, 50 Congress St., archts. A. Kellogg, 585 Boylston St., engr. Noted Aug. 7.

Mich., Port Huron—Port Huron Hospital, 4 story, basement, brick, steel, rein.-con., plain found. $300,000. Architect not selected.

BIDS ASKED

Massachusetts—Sept. 19, by Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, 5 story, basement, brick, steel attendants home, assembly building, at Metropolitan Hospital, plain founds., Trapelo Rd., Waltham, Lexington and Belmont, to exceed $150,000; electrical work, plumbing, heating ventilating, each $25,000 or more each. G. Robb, 14 Beacon St., Boston, archt. E. C. Brown Co., 77 Summer St., and A. C. Franklin Inc., 25 Haverhill St., both Boston, engrs. Noted Aug. 7.

Minn., Hopkins — Sept. 23, by Glen Lake Sanatorium Comn., E. C. Gale, chn., 1430 Rand Bldg., Minneapolis, 3 story, basement, rein.-con., brick, stone hospital, service, near here. $150,000.

Mass., Tewksbury — Sept. 30, by Trustees State Infirmary, 2 story, basement, brick, steel additions to Mens and Womens Hospitals, also Industrial Building, plain founds., for Commonwealth of Massachusetts, Dpt. P. Welfare, State House, Boston. $175,000. Putnam & Cox, 114 State St., Boston, archts.

Utah, Provo—Sept. 26, by State Building Comn., Capitol Bldg., Salt Lake City, 4 story men's ward, for State Mental Hospital. $250,000. J. Nelson, Provo, archt.

CONTRACTS AWARDED

Calif., San Bernardino — Sisters of Charity, Highland and Waterman Aves., 3 story, basement, rein.-con. nurses' home, to F. J. Solt, California Hotel Bldg., $200,000.

Me., West Pownal—State School for Feeble Minded, P. E. Vosburg, supt., 3 story, basement, brick, steel, concrete hospital, to N. W. Dowing, 210 State St., Presque Isle, $140,250; heating and ventilating, to Fels Co., 42 Union St., Portland, $31,515. Noted June 19.

Mass., Danvers — Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, altering 3 story, basement, brick, rear center building, to Morris Constr. Co., 92 Gates St., Lowell, $248,000; heating, to Acme Heating & Ventilating Co., 13 Hawkins St., Boston, $28,988. Noted Aug. 15.

N. Y., Auburn—Mercy Hospital, 6 story, brick, steel, concrete, to J. B. Pike & Son, Inc., 1 Circle St., Rochester. Est. $300,000.

N. Y., Gloversville—Nathan Littauer Hospital, general contract medical laboratory, to C. P. Boland & Co., 101 Park Ave., New York. Est. $150,000.

O., Elyria — Building Comn. Lorain Co., 2 story, basement, brick, concrete, steel tuberculosis sanitarium, to T. J. Hunic, Lorain, $272,335. Noted May 29.

R. I., Pawtucket—Memorial Hospital, E. N. Littlefield, 3 story, basement, brick, stone hospital, plain found., to H. M. Soule, 110 Brook St., Pawtucket. Est. $200,000. Noted July 17.

CHURCHES

PROPOSED WORK

Calif., Los Angeles — Owner, c/o Barber & Kingsbury, archts., Union Insurance Bldg., rein.-con. church, West Adams St. $150,000.

Calif., Pasadena—Lake Avenue Congregational Church, J. H. Hutchins, pastor, plans by Marston & Maybury, 25 South Euclid Ave. (1st unit) church and Sunday school, Lake Ave. and Maple St. $70,000. Total $200,000.

Mass., Attleboro — St. John the Evangelist Roman Catholic Church, J. M. Quinn, pastor, revised plans by Maginnis & Walsh, Statler Bldg., Boston, 1 story, basement, stone, North Main St. $200,000. Noted Aug. 28.

N. Y., New York — Franciscan Poor Clares, 328 Haven Ave., lets contract in October, 3 story, 156 x 183 ft. monastery, Hollywood Ave. and Silver Beach Pl. $300,000. R. J. Reilley, 12 East 41st St., archt. Noted Sept. 11.

Ont., Sandwich—Diocese of London, Roman Catholic Church, Meldrum Rd. $150,000. Architect not selected.

BIDS ASKED

Conn., Hartford—St. Lukes Roman Catholic Church, A. Nilen, bishop, taking bids basement for 1 story, brick, stone church, Eaton St. $150,000. Whiton & McMahon, 805 Main St., archts. Noted Aug. 28.

Conn., Middletown — Methodist Episcopal Church, J. Dodd, chn. Building com., taking bids 1 story, basement, brick, stone church, $200,000. Woodbury & Stuart, 581 Boylston St., Boston, Mass., and Methodist Bureau of Architects, Methodist Episcopal City Mission & Church Extension Society, 17th and Arch Sts., Phila., Pa., archts. Noted Aug. 21.

Mo., Clayton — Sept. 18, by Central Presbyterian Congregation, J. D. Green, chn. Building Com., 1130 Boatmans's Bank Bldg., St. Louis, 1 story, basement, brick, stone, concrete church, auditorium and Sunday school, Hanley Rd. and Davis Pl. $300,000. Jamieson & Spearl, 1116 Arcade Bldg., St. Louis, archts. Noted Aug. 14.

N. J., Bordentown—Sept. 19, by E. G. Perrot, archt., 1211 Arch St., Phila., Pa., general contract 3 story, basement, 50 x 100 ft. monastery and chapel addition, Crosswicks and Lafayette Sts., for Franciscan Monastery of St. Clair. $150,000.

N. J., Irvington (br. Newark)—**N. Hulme**, archt., 1524 Chestnut St., Phila., Pa., bids about Nov. 1, general contract 2 story, basement, brick, steel, plain found., for Methodist Episcopal Church, R. L. Luerich, pastor, 64 Myrtle Ave. $150,000. Noted Aug. 7.

N. J., Jersey City — Monumental Baptist Church, W. S. Smith, pastor, 18 Atlantic St., and J. Armstrong, archt., 36 Gautier Ave., bids about Nov. 15, general contract 3 story, basement, 50 x 100 ft., brick, steel, Atlantic St. $150,000. Noted Sept. 4.

Churches (Continued)

O., Cleveland — St. Vitus Roman Catholic Church, B. J. Pomikvar, pastor, 1114 Norwood Ave., taking bids 1 story, brick, steel, concrete church, East 61st St. and Vitus Ave. $150,000. W. C. Jansen, 1227 Prospect Ave., archt. Noted Aug. 21.

CONTRACTS AWARDED

Calif., Los Angeles — University Methodist Church, 34th St. and University Ave., 85 x 140 ft. rein.-con. church, 34th St. and University Ave., to Simpson Constr. Co., Architects Bldg., $150,000.

Ill., Wilmette—B. B. Shapiro, engr., 6 North Michigan Ave., Chicago, Bahai Temple, 162 ft. high, 202 ft. diam., found. 152 ft. diam. at top of 18 steps, 1st story and minarets 45 ft. high, incl. 550 tons structural steel, 330 tons reinforcing steel, 5,750 bbl. cement, 19,500 ft. glass, rough wire glass for dome and windows, on 9 acre tract Sheridan Rd. and Linden Ave., to George A. Fuller Co., 140 South Dearborn St., Chicago, and Morris Bldg., Phila., Pa., for Research Service, Inc., 1112 Shoreham Bldg., Wash., D. C. Est. $500,000. Noted July 17.

Mass., Everett—Elm St. Baptist Church, E. V. Laird, 150 Elm St., 1 story, basement, brick, stone, plain found., to F. DeSanctis, 220 East Eagle St. Est. $150,000 or more. Noted Aug. 28.

Mo., Parkville—Park College, F. W. Hawley, pres., 1 and 2 story, part basement, rein.-con., brick, stone chapel, to H. H. Fox, 301 East 30th St., Kansas City. Est. $150,000.

N. J., Mendham—R. J. Reilly, archt., 12 East 41st St., New York, general contract 4 story, basement, tower convent and 1 story, basement chapel, brick, steel, to J. J. McMahon, Inc., 40 East 49th St., New York, for Sisters of Christian Charity, Mendham. $150,000. Noted Aug. 21.

SCHOOLS

PROPOSED WORK

Calif., Berkeley—Berkeley School Dist. levying tax to secure $300,000 annually for high school, $75,000 for 2 elementary school units.

Calif., Los Angeles—Bd. Educ., Educational Bldg., plans by A. S. Nibecker, Educational Bldg., Allesandro Ave. School addition, $84,000; 32nd Street School, $135,000, Ralph & Philips, Architects Bldg., heating and ventilating engrs.; Cheremoya Ave. School addition, $40,000; 2 story, 50 x 153 ft., rein.-con., brick, steel, tile gymnasium, 4201 Reed Ave., $50,000.

Ind., Chesterfield — Indiana Spiritualists, 2 story, basement, 114 x 139 ft., brick, steel college, chapel, class rooms, hotel. $150,000. Private plans.

Ind., Hammond—Bd. School Comrs., revised plans by L. C. Hess, George Rogers Clark School, brick, rein.-con. $500,000.

Md., Baltimore—Children's Hospital School, W. S. Baer, in charge, 4 East Madison St., plans by Buckler & Fenhagen, 325 North Charles St., 2 story, brick, stone gymnasium, 41st St. and Green Spring Ave. $175,000.

Mass., Cambridge—Harvard University, A. L. Lowell, pres., revised plans Coolidge, Shepley, Bulfinch & Abbott, Ames Bldg., Boston, 4 story, basement, 2 wings, brick, stone, steel biological building, Oxford St. and Divinity Ave., $2,000,000; heating, plumbing, electrical work, to exceed $25,000. Former bids rejected. Noted Aug. 21.

Mass., Fall River — St. Jean De Baptist Parish, Tucker St., new sketches by F. A. Walker, Union St., 2 story, basement, 60 x 135 ft., 40 x 85 ft. and 60 x 140 ft., brick, school, plain found., Lampher and Field Sts. $150,000. Noted Feb. 27.

Mass., Lynn — City, H. S. Gruver, supt. schools, school, Regina Rd. $150,000 or more. Architect not selected.

Mass., Newton—Boston College, J. M. Kilroy, 140 Commonwealth Ave., School of Journalism, College Grounds. To exceed $150,000. Architect not selected.

Mass., Wellesley — Wellesley College, C. B. Hodges, supt., plans by C. Z. Klauder, 1429 Walnut St., Phila., Pa., brick, steel, stone zoological laboratory. $250,000.

Mich., Bloomfield Hills—Cranbrook Institute of Sciences, plans by E. Saarinen, c/o Owner, 2 story, basement, brick, steel, rein.-con. institute of science, incl. astronomical observatory, museum, scientific workshops, plain found., Lone Pine Rd. $200,000.

Minn., Albert Lea — Hamilton, Fellows & Nedved, archts., 814 Tower Court, soon takes bids 1 story, 72 x 118 ft., brick, stone gymnasium, for Bd. Educ. $140,000. Noted June 19.

N. J., Port Colden — Bd. Educ., Washington Twp., Central School, brick, steel. $150,000. Architect not selected.

N. J., Bayhead—Bd. Educ. sketches by K. W. Dalzell, 263 Central Ave., East Orange, 1 and 2 story, basement, brick, steel, plain found. $155,000.

N. J., Manasquan—Bd. Educ. sketches by Coffin & Coffin, 522 5th Ave., New York, 3 story, basement, brick, steel high school. $250,000. Noted July 17.

N. Y., Newark—Bd. Educ. plans by C. W. Clark, Cortland, new Central School. $300,000.

N. J., Summit—Bd. Educ., 272 Morris Ave., plans by Guilbert & Betelle, 20 Branford Pl., Newark, 2 story, basement, brick, steel, rein.-con., plain found. $150,000.

N. Y., Plattsburgh—State Dpt. Educ., State Office Bldg., Albany, bids latter part month college building and practice school. To exceed $150,000.

O., Cincinnati—University of Cincinnati, H. Schneider, pres., plans by Garber & Woodward, 4 West 7th St., 4 story, basement, 160 x 190 ft., brick, steel, concrete college, Clifton Ave. $400,000.

O., Oxford — Miami University plans by Garber & Woodward, 4 West 7th St., Cincinnati, 2 story, brick, steel, concrete gymnasium, field house. $300,000.

Pa., Grove City—Grove City College plans by W. G. Eckles, New Castle, college buildings, on campus. $750,000. Olmstead Bros., 99 Warren St., Boston, Mass., selected to provide suitable landscaping for 3 structures to be erected.

Tex., San Antonio—St. Anne's Church, c/o A. Feeney, pastor, Fredericksburg Rd. and Ashey St., plans by E. T. Jackson, Builders Exch. Bldg., 2 story, rein.-con., brick school, auditorium, rectory and sisters home, and 2 story, rein.-con., brick church, Lynwood and Warner Sts. $150,000.

Ont., Fort William—Bd. Educ., soon takes bids 3 story, basement, concrete, brick, steel, stone technical school. $400,000. R. E. Mason, Francis Blk., archt.

Ont., Newmarket—Pickering College, Pickering St., plans by Forsey, Page & Steel, 20 St. Clair Ave. W., Toronto, 3 story, basement, 40 x 100 ft., stone, brick, concrete found. $150,000.

Wis., Milwaukee—Bd. Normal School Regents, Madison, plans by A. Peabody, Madison, 2 story, 100 x 170 ft. field house, 50 x 90 ft. gymnasium and power plant, at State Normal School, Downer St. $250,000.

BIDS ASKED

Calif., Antioch — Bd. Trustees Antioch-Live Oak High School Dist., taking bids 2 story, brick high school. Davis-Pearce Co., Inc., Builders Bldg., Stockton, archts.

Ill., Quincy—Bd. Educ., Musselman Bldg., W. E. White, secy., bids about Sept. 25 (extended date), 3 story, basement, 716 x 357 ft., rein.-con., brick high school, 14th St. $1,350,000. Behrens, Meyer & Haffner, Western Catholic Union Bldg., assoc. archts. J. D. Chubb, 109 North Dearborn St., Chicago, engr. Noted May 8.

Mass., Worcester — Sept. 26, by Business Agent Dpt. Educ., State House, Boston, general contract state normal school, for Commonwealth of Massachusetts, Boston. To exceed $150,000. Frost, Chamberlain & Edwards, Slater Bldg., archts. R. D. Kimball Co., 6 Beacon St., Boston, engrs. Noted Sept. 11.

Mo., Tarkio—Sept. 29, by Bd. Trustees Tarkio College, 2 story, basement, 60 x 150 ft., brick, steel, concrete administration and chapel building, Felt, Dunham & Krichn, 300 West 47th St., Kansas City, archts. Noted May 15.

N. J., Fort Lee—Bd. Educ., J. F. Whitteker, pres., High School, bids about Oct. 15, 2 story, basement, brick, steel, rein.-con. addition, Palisade Ave. $150,000. Hacker & Hacker, 201 Main St., Fort Lee, archts. Noted Aug. 21.

N. J., Irvington (br. Newark)—Bd. Educ., 1253 Clinton Ave., bids about Oct. 15, general contract, altering 2 story, basement, brick, steel addition, Grove St. $170,000. Schneider, Kleeman & Werther, 1007 Broad St., Newark, archts. Noted Aug. 7.

N. J., Leonardo—Sept. 25, by Bd. Educ., Middletown Twp., W. M. Petingale, Leonardo High School, Leonardo Grade School, $150,000, and Leonardo High School, $180,000, 2 story, basement, brick, steel. E. A. Arend, Kinmouth Bldg., Asbury Park, archt. Noted Aug. 14.

N. J., New Brunswick—Bd. Educ., Livingston Ave., bids about Nov. 1, 2 story, basement, brick, steel, rein.-con. addition to Senior High School, Livingston Ave. $150,000. A. Merchant, 1 Elm Row, archt. Noted Sept. 4.

N. J., Summit—Bd. Educ., 272 Morris Ave., bids about Oct. 1, general contract 2 story, basement, brick, steel addition to Franklin School. $150,000. Guilbert & Betelle, 20 Branford Pl., Newark, archts. Noted Aug. 8.

N. J., Union City—F. J. Ricker, archt., 685 Hudson Ave., West New York, taking bids general contract 3 story, basement, 70 x 140 ft. high school addition, 32nd St. and Central Ave., for Holy Family Roman Catholic Church, J. N. Grief, pastor, c/o architect. $150,000. Noted Sept. 11.

O., Canton—Sept. 23, by Bd. Educ., Canton Twp. Rural School Dist., Stark Co., at North Industry, E. S. Hines, clk., fireproof addition to Prairie College School. C. E. Firestone and L. Christman, 900 Renkert Bldg., Canton, archts.

O., Carthagene — Sept. 23, by W. Koehl, archt., 1900 Euclid Bldg., Cleveland, 3 story, basement, brick, steel, concrete, seminary, for Congregation of the Precious Blood, I. Wagner, pastor. $300,000.

Okla., Oklahoma City—Sept. 29, by J. C. Stearley, clk. School Bd., Stonewall Jackson Junior High School, 2 story, basement, 176 x 180 ft., rein.-con., brick, plain found. $170,000. Layton, Hicks & Forsythe, Braniff Bldg., archts. Noted May 22.

Pa., Grove City—Sept. 19, by W. G. Eckles & Co., archts., Law Savings & Trade Bldg., New Castle, brick, limestone or sandstone science building, on campus, for Grove City College. $300,000.

Pa., Loretta—Sept. 13, by W. Griffin, secy. Bd. Governors St. Francis College, 3 story, 46 x 98 ft., brick, steel, stone tile science building. $300,000. A. M. Tadejeski, 1137 Ridge Ave., Johnstown, archt.

Pa., Somerset—Sept. 22, by Bd. Educ., I. J. Walker, secy., East Union Ave., 3 story, (no basement), 123 x 148 ft., brick, tile, stone terra cotta, rein.-con. high school, incl. swimming pool. $150,000. E. H. Walker & Mong, 226 East Church St., archt.

CONTRACTS AWARDED

Calif., San Jose—San Jose City School Dist., Herbert Hoover Junior High School, 2 story, rein.-con., ornamental iron, sheet metal, to Neve & Hart, 891 Harrison St., $119,700. Noted July 31.

Ill., Chicago — University of Chicago, 1st South Michigan Ave., general contract groups 2 and 5, story, 240 x 341 ft., men's dormitories to Bulley & Andrews, 2040 West Harrison St., Nesler & Rich, engrs., 431 South Dearborn St., taking bids sub-contracts. Foundation completed. Total est. $1,500,000. Noted Sept. 11.

Me., Fryeburg — J. C. and J. H. Stevens, archts., 447 Congress St., Portland, 2 story, basement, 2 wings, brick, steel academy, concrete found., to Davison & Swanberg, 37 Amherst St., Manchester, N. H., for Fryeburg Academy. $150,000. Noted Aug. 28.

Mich., Escanaba—Bd. Educ., general contract high school, to Madsen Constr. Co., 618 Natl. Bldg., Minneapolis, Minn., $312,551; plumbing, heating, sheet metal, pipe covering, to C. J. Dykman Co., 603 Building & Loan Bldg., Grand Rapids, $64,444. Noted Aug. 7.

Minn., St. Paul—St. Joseph's Academy, Western Ave. and Nelson St., general contract 4 story, basement, rein.-con., brick, stone, to W. Butler Co., 630 Hamm Bldg., St. Paul. Est. $250,000. Noted Sept. 11.

Mo., Jefferson City—Lincoln University, State College for Negroes, I. C. Tull, business mgr., 2 story, basement, 63 x 99 ft. home economics building, 2 and 4 story, basement, 80 x 200 ft., educational building, both rein.-con., brick, to H. W. Underhill Constr. Co., Jefferson City. Est. $300,000. Noted Sept. 4.

N. J., New Vernon—Bd. Educ., Harding Twp., general contract 2 story, basement, brick, steel school addition, to Main Constr. Co., 110 Park Pl., Passaic. Est. $150,000.

O., Alliance—City, 2 story, basement school, southwest section, to Wendling Bros. Co., Dover. $150,000.

Pa., Conemaugh—Bd. Educ., Franklin Boro., M. Singel, secy., Franklin, general contract 2 story, 96 x 120 ft., brick, hollow tile addition to high school, to Yenter Bros., Lincoln Ave., Tyron, $114,000.

Ont., North Bay—S. B. Coon & Son, archts., 4 St. Thomas St., Toronto, 3 story, basement, 110 x 175 ft., rein.-con., brick, stone vocational school, incl. 4 shops, gymnasium, domestic dpt., auditorium, Ferguson St., to Cox Constr. Co., 46 King St. W., Toronto, for High School Bd., Toronto. Est. $225,000. Interested in prices of everything. Noted Aug. 21.

Ont., Sudbury—Bd. Educ., 3 story, basement, brick, concrete, stone, steel addition to High and Technical School, to Cox Constr. Co., Ltd., 46 King St. W., Toronto. Est. $150,000.

THEATRES

PROPOSED WORK

Ind., Evansville—Fine Bros. plans by A. E. Neuoks, Old Natl. Bank Bldg., 2 story, 53 x 113 ft., brick, steel, Washington Ave. $150,000.

BIDS ASKED

Ia., Davenport—A. S. Graven, Inc., archts., 100 North La Salle St., Chicago, Ill., bids about Sept. 25 (extended date), 10 story, basement, 150 ft. 7 in. x 192 ft. 11 in. rein.-con., steel, stone, granite found., incl. apartments, 3rd and Brady Sts., for G. M. Bechtel, $2,000,000. Noted Aug. 28.

BANKS

BIDS ASKED

Del., Wilmington—Fidelity Bank & Trust Co., 535 5th Ave., lets general contract late in fall, bank, incl. office. O. Lowinson, 150 5th Ave., New York, archt. Noted Apr. 24.

N. J., Montclair—Town Trust Co., 79 Walnut St., sketches by Holmes & Von Schmid, 42 Church St., 1 story, basement, mezzanine, Grove St. $150,000.

N. J., South Orange — Myers & Shanley, archts., 24 Walnut St., Newark, revising plans and takes bids about Oct. 1, general contract altering and constructing 2 story brick, steel bank addition, South Orange Ave., for South Orange Trust Co., 53 South Orange Ave. $150,000. Noted Sept. 11.

N. Y., New York—Chase National Bank, 18 Pine St., preliminary sketches by Trowbridge & Livingston, 527 5th Ave., 60 story bank, office, Exchange Pl., Wall, Broad and Williams Sts.

O., Hamilton—Weary & Alford, archts., 1923 Calumet Ave., soon takes bids 2 story, brick, stone, bank, incl. office for 2nd Natl. Bank. $300,000. Noted Aug. 21.

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Banks (Continued)

BIDS ASKED

Mass., Lynn — Sept. 23, by Equitable Co-Operative Bank, T. W. Hixon, 145 Munroe St., pres., and T. M. James Co., 3 Park St., Boston, archts., 2 story, basement, brick, steel, concrete, concrete found., Willow and Oxford Sts. $150,000 or more. Noted Sept. 4.

CONTRACTS AWARDED

N. J., Trenton—Trenton Banking Co., West State and North Warren Sts., 2 story addition, North Warren St., to Karno-Smith Co., Broad St. Bank Bldg., $92,728.

N. Y., New York—Estate of F. Fish, c/o Bank of New York & Trust Co., 48 Wall St., bank and office, to Fred T. Ley, 578 Madison Ave., New York. Contractor awarded steel, to Harris Structural Steel Co., 419 4th Ave. Noted May 29.

OFFICES

PROPOSED WORK

Calif., Los Angeles—Western National Co., c/o R. Falkernath, Jr., archt., Chamber of Commerce Bldg., 13 story, basement, 132 x 150 ft., concrete, steel, incl. stores, 6th and Olive Sts. $2,000,000.

Calif., San Francisco — Norwich Union Fire Insurance Co., 234 Sansome St., sketches by Weeks & Day, Financial Center Bldg., 15 story, rein.-con., steel, Sansome St. $600,000.

Conn., Bridgeport — Schnee & Schnee, 420 Lexington Ave., New York, plans by Fletcher Thompson, Inc., 542 Fairfield Ave., 2 story, 100 x 185 ft., rein.-con., stone, Golden Hill St. $150,000.

N. J., Montclair—Pub. Serv. Production Co., 80 Park Pl., Newark, office, service rooms, garage, shop and boiler house, 101 Greenwood Ave. $150,000. Private plans.

N. J., Perth Amboy—M. Peterson, Gordon and Kearny Aves., 2 story, basement office, stores, Smith St. $150,000. Private plans. Noted Sept. 4.

N. Y., Flushing—Blanchard Realty Co., 425 Riverside Dr., New York, soon lets general contract office, Main St. and 39th Ave. $150,000. H. I. Feldman, 15 West 44th St., New York, archt.

N. Y., New York—Eighty East 56th Street Corp., S. Sinskoff, pres., 521 5th Ave., plans by Schwartz & Gross, 347 5th Ave., 17 story, 33 x 100 ft., brick, steel office, storage, manufacturing, 78 East 56th St. $175,000.

N. Y., New York—One Hundred Forty East 54th Street Corp., L. A. Coffin, pres., 114 East 54th St., plans by Polhemus & Coffin, 232 Madison Ave., 13 story, 71 x 86 ft. doctor's professional building, 138 East 54th St., $350,000.

N. Y., New York—Tishman Realty Co., 285 Park Ave., plans by E. J. Kahn, 2 Park Ave., 19 story, 50 x 100 ft., steel, brick, rein.-con., incl. stores, 691 Lexington Ave.

BIDS ASKED

N. Y., New York—Three Hundred Twenty-One West 44th St., Inc., H. M. Warner, pres., taking bids 10 story, 125 x 200 ft. office and film exchange, 315 West 44th St. $300,000. T. W. Golding, 607 5th Ave., archt.

CONTRACTS AWARDED

Calif., Los Angeles—Serranno Corp., 12 story office section, 2 story store section, 51 x 86 ft., rein.-con., ornamental iron, tile, steel, marble, Wilshire Blvd. and Western Ave., to W. Simpson Constr. Co., 1007 Architects Bldg., $1,250,000.

N. Y., New York—Stone & Webster Building Co., 120 Bway., 50 story, office, 27 Bridge St. and 98 Broad St., to A. L. Hartridge Co., 120 Bway. Noted Apr. 17.

N. Y., New York—Three Hundred Eighteen East 47th Street, Inc., D. Picket, pres., 271 Madison Ave., 6 story office, manufacturing, showrooms, 318 East 47th St., to Magoba Constr. Co., 271 Madison Ave. Est. exceeds $150,000.

Tex., Lubbock — Temple Ellis, rebuilding 6 story, basement, 76 x 115 ft., rein.-con., brick, incl. stores, Broadway and Texas Sts., to J. J. Clements, 1808 16th St. Est. $180,000

STORES

PROPOSED WORK

Ill., Chicago—Klee Bros., 1200 Milwaukee Ave., plans by A. Epstein, 2000 West Pershing Rd., 4 story, 45 x 61 x 81 ft. store, Ashland, Lincoln and Belmont Aves. $300,000.

Minn., St. Paul—Robert Street Associates, c/o Cushing & Driscoll, agts., 315,360 Robert St., rebuilding 6 story, basement store, 4th and Minnesota Sts., destroyed by fire. $150,000.

CONTRACTS AWARDED

Calif., Los Angeles—See "Offices."

N. Y., New York—Corporation, c/o Houston Properties Corp., A. B. Jones, pres., 10 East 40th St., 18 story, 90 x 200 ft. stores, apartment, 1st Ave., 56th and 57th Sts., to Dwight P. Robinson Co., 125 East 46th St. Est. $2,000,000. Only sketches now, indefinite when contractor will take separate contract bids.

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PUBLIC

PROPOSED WORK

N. J., Jersey City—LIBRARY—Bd. Trustees Free Pub. Library, 422 Jersey Ave., sketches 2 story, basement, brick branch library, Magnolia and Summit Aves. $150,000.

N. Y., Auburn—CELL BLOCK—Dpt. Correction, State Office Bldg., Albany, bids latter part month, North Cell Block, foundry and shop building, bakery, kitchen and mess hall at Auburn State Prison. Noted Mar. 20.

N. Y., Beacon—DORMITORY—Dpt. Correction, State Office Bldg., Albany, bids in October, female ward building dormitory, auditorium and chapel and connecting corridors, Matteawan State Hospital. Noted Mar. 20.

N. Y., Clinton—CELL BLOCK—Dpt. Correction, State Office Bldg., Albany, bids in October, East Cell Block, new segregation building, laundry and baths, at Clinton State Prison.

N. Y., Comstock—ADMINISTRATION—Dpt. Correction, State Office Bldg., Albany, bids in October, administration building, at Great Meadows Prison. Noted Mar. 20.

N. Y., Elmira—REFORMATORY—Dpt. Correction, State Office Bldg., Albany, bids latter part month, school, hospital at Elmira State Reformatory.

N. Y., New York—CELL BLOCKS—Police Dpt., 240 Center St., plans by T. E. O'Brien, 400 Broome St., altering and reconstructing cell blocks at 9 Oak St., $15,800; at 146 East 126th St. and at 134 West 100th St., $15,000 each; also at 325 East 22nd St., $12,000.

N. Y., Yonkers—FIRE HOUSE and POLICE STATION—City plans by H. L. Quick, 18 Getty Sq., 3 story, 84 x 88 ft. fire house and police station, $225,000. Noted May 15.

Tenn., Memphis—WORKHOUSE—Shelby Co., E. W. Hale, comr., plans by Hanker & Cairns, 123 South Court St., laundry, woman's dormitory addition to workhouse on 1,400 acre farm, Mullins Station. $200,000.

Tex., Corpus Christi — COURT HOUSE — Nueces Co., c/o N. Benton, judge, soon takes bids 5 story, rein.-con., brick, tile annex. $100,000. Levy & Dielman, State Natl. Bank Bldg., archts. Noted Sept. 4.

Tex., Amarillo—COURT HOUSE—Potter Co., c/o S. B. Motlow, judge, plans by Townes, Lightfoot & Funk, Johnson Bldg., 8 story, basement, 80 x 132 ft., rein.-con., stone, 40,000 sq.ft. floor space. $420,000 bonds voted for same. Noted Aug. 7.

Ont., Toronto — EXHIBITION — Canadian National Exhibition, Lumsden Bldg., plans by D. E. Kertzland, 6 Hayden St., 1 story, mezzanine, part basement, 234 x 474 ft., stone, steel, concrete found., Exhibition Park. $1,000,000.

Ont., Toronto—STABLE—Canadian National Exhibition, Lumsden Bldg. and Royal Winter Fair, 146 King St. W., plans by J. J. Woolnough, city archt., City Hall, 2 story, 200 x 500 ft., horse stable building, concrete, brick, stone, steel, Exhibition Park. $1,000,000.

BIDS ASKED

La., New Orleans—ALMS HOUSE—Oct. 7, by City Council, 2 and 3 story, 197 x 204 ft., brick, stucco, concrete home. W. R. Burke, Balter Bldg., archt.

CONTRACTS AWARDED

Ill., Decatur — ARMORY — State of Illinois, Capitol Bldg., Springfield, 2 story, 110 x 136 ft., North Jackson St., to C. Westberg, 6234 Oakley Ave., Chicago, $187,985. Noted July 11, 1929.

Mass., Braintree—FIRE and POLICE STATION—Town, E. Avery, chn. com., 2 story, basement, brick, stone, steel central fire and police station, plain found., to Dacey & Tibbetts, Inc., 40 Court St., Boston. Est. $150,000. Noted Aug. 28.

Mass., Mattapan—LIBRARY—City of Boston, Library Dpt., superstructure 1 and 2 story, basement, brick, limestone, plain found., Hazelton St., to Dacey & Thibbetts, 40 Court St., Boston. Total est. $150,000. Noted Aug. 21.

N. J., Maplewood (br. South Orange)—POLICE STATION—Police Dpt., Municipal Bldg., general contract 2 story, basement, brick, steel, Dunnelle Rd., to Eastern Building Co., 270 Fabyan Pl., Newark. Est. $150,000. Noted Aug. 28.

N. J., Rahway—REFORMATORY—Dpt. Institutions & Agencies, State Office Bldg., Trenton, general contract 4 story, basement, 50 x 268 ft., brick, steel addition to main building, to C. R. Hedden Co., 351 South Orange Ave., Newark. $153,800. Noted Aug. 28.

Tex., Beaumont—COURT HOUSE—Jefferson Co., c/o B. B. Johnson, judge, 14 story, basement, 108 x 240 ft. and 11 story, 61 x 101 ft., brick, steel, rein.-con., to McDaniel Bros., Kyle Bldg., $632,439; elevators, to American Elevator & Mchy. Co., 2825 Orange St., $41,723; plumbing, heating, ventilating and refrigeration, to Plumbing & Heating Co., Inc., 985 Orleans St., $73,000. Grand total $767,162. Noted Aug. 15.

BUILDINGS—UNCLASSIFIED

PROPOSED WORK

Calif., Los Angeles—PUBLISHING PLANT—California Newspaper Assn., 510 South Spring St., plans by F. D. Rutherford, Mills-Fraser Bldg., Santa Monica, 2 story, basement, 115 x 130 ft., concrete, North Wilcox Ave. $175,000.

Mich., Birmingham—EXCHANGE—Michigan Bell Telephone Co., 1365 Cass Ave., Detroit, plans by Smith, Hinchman & Grylls, 800 Marquette Bldg., Detroit, 3 story, basement, brick, rein.-con., steel, plain found., Martin and Henrietta Sts. $750,000.

N. J., Jersey City—GARAGE—Bergen Square Garage, c/o C. Shilowitz, archt., 26 Journal Sq., 5 story, basement, brick, steel. Bergen Ave. $500,000.

N. J., Jersey City—GARAGE—Burstyn Heftler Corp., 821 Bergen Ave., rejected bids 8 story, basement, 130 x 225 ft., brick, steel, Bergen Ave. and Academy St. $450,000. C. Shilowitz, 26 Journal Sq., archt. Noted May 8.

N. J., Keyport—EXCHANGE—New Jersey Bell Telephone Co., 540 Broad St., Newark, plans by H. B. Brady, Inc., 333 North Broad St., Newark, 2 story, basement, brick, steel, plain found. $150,000.

N. Y., New York—GARAGE and STORE—R. Lowenthal, 1880 Grand Concourse, sketches by A. Slavin, 2690 University Ave., 50 x 190 ft. service garage and stores, Bailey Ave. and 230th St. $150,000.

N. Y., New York—HORTICULTURE—State Agricultural Experiment Station, bids latter part month, horticulture building. To exceed $150,000.

N. Y., New York—PUBLISHING PLANT—A. Kahn, archt., 229 West 43rd St., soon takes bids general contract 14 story, 100 x 243 ft. publishing plant and printing addition for New York Times, 221 West 43rd St. $600,000.

O., Youngstown — NEWSPAPER PUBLISHING PLANT — Youngstown Telegram of Scripps Howard Syndicate, plans by J. W. Thomas, 3868 Carnegie Ave., Cleveland, 3 story, basement, brick, rein.-con. $400,000. Noted Dec. 19.

Pa., Phila. — GARAGE — Kent Automatic Garage Co., 350 Madison Ave., New York, plans by Jardine, Hill & Murdock, 307 Madison Ave., New York, 26 story, 15th St. between Walnut and Locust Sts. $2,000,000.

Ont., Hamilton—RAILROAD STATION—See "Railways."

Ont., Toronto—PARKING GARAGE—Edwin H. White Syndicate, 902 Central Bldg., 12 story, 100 x 100 ft., brick, steel, concrete found. $500,000. Engineer not selected.

BIDS ASKED

Mo., St. Louis—MERCHANDISING MART—Terminal Railroad Assn., 1800 Market St., bids about Oct. 11, 8 story, basement, 330 x 358 ft., 20 story tower, rein.-con., brick, stone, 12th, 13th, Spruce and Poplar Sts. $5,000,000. W. J. Knight & Co., Wainwright Bldg., engrs., St. Louis Mart, Inc., c/o H. C. Martin, 315 North 10th St., lessee. Noted Aug. 14.

N. J., Newark — ART GALLERY and MUSEUM — J. H. and W. C. Ely, archts., 605 Broad St., taking bids 3 story, basement, brick, steel art gallery and museum, Bway. and Taylor St., for New Jersey Historical Society, 16 West Park St. $350,000.

N. J., Paterson — HOME — Lee & Hewitt, archts., 152 Market St., taking bids general and separate contracts 2 story, basement, brick, steel addition, plain found., Jackson St., for St. Francis Home, 25 Jackson St. $150,000. Noted Aug. 28.

CONTRACTS AWARDED

Calif., San Francisco—FILM EXCHANGE—Bell Bros., Mills Bldg., two 2 story, rein.-con. buildings, Eddy and Hyde Sts., to Cahill Bros., 206 Sansome St., $150,000.

Ia., Davenport—HOME—Royal Neighbors of America, c/o L. E. Walsh, vice chn., general contract Old Folks Home, 2 story, basement, 46 x 149 ft. main building with 36 x 59 ft. dining room and 36 x 68 ft. kitchen wings, concrete, brick, Bedford stone, hollow tile, to Greenleaf Constr. Co., Rock Island, Ill., $160,302; heating and plumbing, to Ryan Plumbing & Heating Co., 403 Brady St., Davenport.

N. J., East Orange—EXCHANGE—Voorhees, Gmelin & Walker, archts., 101 Park Ave., New York, 3 story, basement, 105 x 195 ft., brick, steel, to W. Robertson & Son, 15 Exchange Pl., Jersey City, for New Jersey Bell Telephone Co., 540 Broad St., Newark. Noted Aug. 28.

Buildings

FACTORIES AND MILLS

PROPOSED WORK

Calif., Oakland—FACTORY—Bluebird Potato Chip Co., 68th Ave. and Beck St., sketches 1 story, rein.-con., 1st Ave. and 14th St. $40,000. Architect not selected.

Ill., Nokomis—PLANT—Indiana and Illinois Coal Co., preliminary plans coal screening plant, remodeling tipple for Coal Mine 10. $100,000. Private plans.

Ind., South Bend—FACTORY—Bendix Aviation Co., Plant "B," brick, steel. $125,000. Private plans.

Md., Baltimore—ICE CREAM PLANT—Jersey Ice Cream Co., 1726 East Pratt St., 2 story, 100 x 185 ft., brick, steel, concrete addition, 122-32 South Ann St. $175,000. McCormick & Co., 121 South Negley Ave., Pittsburgh, Pa., engrs.

Mass., Hyde Park—FACTORY—Condit Electric Mfg. Co., 344 Hyde Park Ave., sketches altering and constructing 2 story, brick addition. $50,000. Private plans.

Buildings—Factories and Mills (Continued)

Mass., New Bedford—NEWSPAPER PLANT—New Bedford Time, Purchase and Middle Sts., sketches by E. G. Bullard, Time Bldg., altering and constructing 2 story, brick newspaper plant and office addition, $50,000.

N. J., Bound Brook—FACTORY—Pathe Exchange, Inc., Middlesex Boro, plans by J. N. Pierson & Son, 198 Jefferson St., Perth Amboy, 1 story, basement, brick, plain found, $40,000.

N. J., Camden — FACTORY — Francesco & Jacobus, engrs, and archts., 511 5th Ave., New York, bids latter part of month 5 or 7 story, 129 x 339 ft., Arch and 2nd Sts., for Continental Can Co., 1 Pershing Sq., New York, $1,000,000. Noted Sept. 4.

N. Y., Astoria—BAKERY—Sussman Bros., 547 Grand Ave., soon takes bids general contract bakery, 25th Ave. and 45th St. $40,000. J. H. Galloway, Jackson Heights, archt.

N. Y., New York—REPAIR SHOP—F. Levy, 60 Wadsworth Ave., plans by B. R. Swartburg, 2 West 46th St., auto repair shop, 651 West 176th St. $40,000.

N. Y., Stapleton (sta. Staten Island)—FACTORY—Rubsam & Harrman Brewing Co., 191 Canal St., rebuilding brewery. To exceed $300,000.

O., Cleveland—FACTORY—Norcross Marble Co., J. W. Young, mgr., Harvard Ave. and Jennings Rd., 1 story, 60 x 225 ft., brick, steel addition, $75,000. Private plans.

O., Cleveland — FACTORY — Telling-Belle Vernon Co., W. E. Telling, chn., 3825 Cedar Ave., 4 story, basement, brick, rein.-con. addition, $200,000. A. F. Gleim, c/o Owner, engr. Private plans.

Pa., Bloomberg—PLANT—American Car & Fdry. Co., 30 Church St., will rebuild manufacturing plant, recently destroyed by fire. Est. exceeds $150,000. **Maturity indefinite.**

Pa., Salemville—COAL WASHING PLANT and TIPPLE—Keystone Coal Co., Greensburg, rebuilding plant, destroyed by fire. $150,000. Private plans.

Wis., Carrollville—FACTORY—Newport Co., plans by F. Scott, 214 Mason St., Milwaukee, 4 story, basement, 140 x 220 ft., brick, steel factory.

Ont., Hamilton — PACKING PLANT — John Duff & Sons Ltd., J. F. Duff, pres., Hillyard St., plans by Stewart McPhie, Sun Life Bldg., packing plant, incl. new equipment, Brant St. $75,000.

Ont., London—CEREAL FACTORY—Kellogg Co., W. Kellogg, mgr., Battle Creek, Mich., factory addition, incl. equipment, Dundas St. $250,000.

Ont., Petrolia—REFINING and STORAGE PLANT—Canadian Oil Companies Ltd., 12 Strachan Ave., Toronto, concrete, brick, steel additions to oil refining and storage plant. $250,000. Private plans.

BIDS ASKED

Ind., St. Meinrad—PRINTING PLANT—Abbey Press taking bids 2 story, basement, 65 x 160 ft., rein.-con., brick, stone. $75,000. E. C. Berendes, 8 Keohler St., Evansville, archt. Freight elevator, stoker, steam heating plant, wood-block flooring, steel sash.

Mich., Detroit — FACTORY — C. W. Brandt, archt., Francis Palms Bldg., taking bids 1 story, 40 x 300 ft., aluminum parts factory, brick, steel, plain found., Jos. Campau Ave., for Bohn Aluminum & Brass Co., 2512 East Grand Blvd. $45,000. Noted July 31.

N. J., Carteret — REFINING PLANT — See "Contracts Awarded."

N. J., Newark — FACTORY, etc. — R. C. Klemm, archt., 944 Bway., Newark, bids about Oct. 1, general contract 1 story, basement, brick, steel factory, garage, 1820-22 Oxford St., for A. Kaminski, c/o architect. $40,000. Noted Sept. 4.

N. J., Rutherford—FACTORY—F. Pirrone, archt., 104 Midland Ave., Garfield, taking new bids 2 story, basement, brick, steel, rein.-con. addition, plain found., 23 West Erie Ave., for Salvatore Cordo, 23 West Erie Ave. $40,000. Former bids rejected. Noted July 24.

N. Y., Brooklyn—CARPET CLEANING—D. L. Brush, Lexington and Tompkins Aves., taking bids carpet cleaning plant, Lexington and Tompkins Aves. $45,000. Lake & Williamson, 415 Lexington Ave., New York, archts.

N. Y., New York — FACTORY — Ramagate Realty Co., H. Wacht, pres., 565 5th Ave., taking bids separate contracts 2 story, basement manufacturing and restaurant, 179 Varick St. $50,000. C. Whinston & Bro., 2 Columbus Circle, archts.

CONTRACTS AWARDED

Calif., Riverside—PRE-COOLING PLANT—Casa Blanca Packing House, 2 story, basement, 70 x 90 ft., rein.-con., to Gay Eng. Corp., 2650 Santa Fe Ave., Los Angeles.

Mass., Hyde Park—FACTORY—Condit Electric Mfg. Co., 344 Hyde Park Ave., altering and constructing 2 story, brick, timber addition, Hyde Park, to C. A. Dodge Co., 2 Erie St., Cambridge. Est. $50,000.

Mass., Leominster — PLANT — Du Pont Viscoloid Co., R. W. Brokaw, Arlington, N. J., Building 100, 3 story, 75 x 125 ft., brick, timber glass plant unit, to Wiley & Foss, Central St., Fitchburg. Est. exceeds $40,000. Noted Sept. 4.

Mo., Maplewood—LAUNDRY—The Laundry, Inc., general contract remodeling, repairing 1 story, basement, brick, concrete, 7315-19 Manchester Ave., to Austin Co., 1102 Arcade Bldg., St. Louis. Est. $50,000.

Mo., St. Louis — MILK DISTRIBUTING PLANT, etc. — Bailey Farm & Dairy Co., 5005 Alabama Ave., 2 story, basement, 37 x 90 ft. milk distribution plant, and 1 story, 35 x 150 ft. service building, to Kellerman Contg. Co., Buder Bldg.

Mo., St. Louis—OIL BULK PLANT—Standard Oil Co., of Indiana, 314 North Jefferson Ave., 1 story, basement, 72 x 115 ft. gasoline and oil bulk station, rein.-con., brick, Easton and Grove Aves., to M. P. Rosenmeyer, 1111 Title Guaranty Bldg.

Mo., St. Louis — PUBLISHING PLANT — Globe-Democrat Publishing Co., 6th and Pine Sts., general contract 5 story, basement, 103 x 340 ft., concrete, brick, steel, stone, High and Franklin Aves., 12th and Wash Sts., to Westlake Constr. Co., Railway Exch. Bldg.

N. J., Carteret—FACTORY—Poggi & Bragdon, archts., 275 Morris Ave., Elizabeth, altering and constructing 2 story, basement, brick, steel addition, to J. Cselle, 17 Atlantic Ave., Carteret, for B. Moore & Co., c/o architects. $40,000. Noted July 31.

N. J., Carteret—REFINING PLANT—United States Metal Refining Co., foot Delamar Ave., brick, separate contracts. $40,000. Private plans.

N. J., Deal — LABORATORY — New Jersey Bell Telephone Co., 540 Broad St., Newark, general contract, 1 story, basement, brick steel laboratory to J. Sutherland Co., Inc., 222 Main St., Asbury Park. Est. $40,000.

N. J., Newark—LAUNDRY—Crippled Children's Home, Park Ave., general contract altering and constructing 2 story, basement, brick addition, 89-103 Park Ave., to Eustice Bros., Inc., 111 Academy St. Est. $40,000.

N. Y., Brooklyn—ICE PLANT—Paramount Ice Co., 241 Ellery St., ice manufacturing plant, Steuben St. and Myrtle Ave., to W. Werner & Son, 110 Hale Ave. Est. $60,000.

N. Y., White Plains—BAKING PLANT—H. Holder, archt., 242 Franklin Ave., Brooklyn, general contract 60 x 260 ft. baking plant, garage, to I. F. Stier, Madison, N. J. for Dugan Bros., 290 South 5th St., Brooklyn. Est. $150,000. Noted July 10.

O., Akron—ICE CREAM PLANT—Braziell & Anderson, archts. and engrs., 309 4th Ave., Pittsburgh, Pa., 3 story, basement, brick, steel, concrete, to C. W. P. Constr. Co., 2nd Natl. Bldg., Akron, for Telling-Bell-Vernon Co., 235 East Exchange St. $250,000. Noted Aug. 21.

O., Cleveland—FACTORY—Dobeckmun Co., T. F. Dolan, pres., 1311 West 80th St., 1 story, 100 x 262 ft., brick, steel, to Wm. Dunbar Co., 8201 Cedar Ave. Est. $75,000. Noted Sept. 11.

O., Cleveland—PRINTING PLANT—Gospel Workers Publication, 2380 West 7th St., 2 story, basement, brick, rein.-con. addition, to J. G. Woide, 1659 Est 86th St. Est. $50,000.

Pa., Curwensville — TANNERY — Frankling Tanning Co., C. A. Cross, pres., foundation for 2 story, basement, 50 x 500 ft. tannery, to W. E. Miller, Glen Willard. Total est. $40,000.

Pa., Phila. — BAKERY — C. B. Comstock, archt., 122 East 42nd St., New York, 1 story, basement, 30 x 280 ft., rein.-con., brick, steel, plain found., to Philip Harbach Co., 1261 North 26th St., for Freihofer Baking Co., 20th and Indiana Sts. Est. $75,000. Noted Aug. 21.

Wis., Milwaukee—FACTORY—A. O. Smith Corp., 27th and Keefe Sts., 1 story, 225 x 245 ft., brick, steel, to Worden-Allen Co., Port Washington St. Est. $200,000.

B. C., North Vancouver — CREOSOTING PLANT — Vancouver Creosoting Co. Ltd., additions to creosoting plant, incl. tanks, to Vulcan Iron Wks., Graville Island; cylinder, etc., to Vancouver Mchry. Dpt., 1155 West 6th St.; incisor, to Maple Leaf Iron Wks. Ltd., 4251 Alexander St.; wharf, to W. Greenlees, Beatty St., Vancouver. Total est. $150,000.

Ont., New Toronto—BRASS FACTORY—Anaconda American Brass Ltd., masonry contract, 70 x 450 ft. and 98 x 200 ft., both 1 story, brick additions, concrete founds, to Herod Constr. Co., 99 Stanley Ave., Mimico. Est. $200,000.

GARAGES

PROPOSED WORK

N. Y., Jamaica—Felberose Holding Co., 15 Twombly Pl., 2 story service garage, Twombly Pl. and Jamaica Ave. $60,000.

N. Y., New York—Helklar Realty Co., L. N. Heller, pres., 1891 Washington Ave., plans by H. I. Feldman, 15 West 44th St., New York, 2 story 100 x 109 ft. service garage, Webster Ave. and 204th St. $75,000.

N. Y., New York—Rohrfield Holding Corp., S. Roshosky, pres., 530 Trixton St., plans by Franklin, Bates & Heindsmann, 2526 Webster Ave., 100 x 100 ft. service garage, Randall Ave. $40,000.

BIDS ASKED

N. Y., Middle Village — See "Contracts Awarded."

N. Y., New York — Hoffman Development Corp., 147 East 51st St., bids in Dec., general contract 7 story, service garage, 232 East 36th St., $75,000. C. Schaefer, Jr., 332 East 149th St., archt.

CONTRACTS AWARDED

Conn., Greenwich—E. Fitzsimmons, Jr., Railroad Ave., 2 story, 80 x 130 ft., brick, steel service garage, Railroad Ave., to J. L. Duge & Sons, 81 Railroad Ave. Est. $50,000.

Me., Westbrook — Portland Water Dist. 16 Casco St., Portland, 2 story, brick, steel service garage, shop and office, to O. G. K. Robinson, 17 Fitch St., Portland. Est. $40,000. Noted July 3.

Mass., Newton — Elmwood St. Garage, 49 Elmwood St., 1 story, brick, concrete, steel service and repair garage, concrete found., to Arlington Constr. Co., 691 Massachusetts Ave. Est. $40,000. Noted Aug. 21.

N. Y., Middle Village — F. T. Lang, 17-80 Metropolitan Ave., 2 story, 90 x 136 ft. service garage, Metropolitan and Juniper Aves., separate contracts. To exceed $40,000. Private plans.

Pa., Phila.—Philadelphia Coke Co., 450 Richmond St., 1 story, 65 x 220 ft., brick, steel plant found., 4501 Richmond St., to Hughes Foulkrod Co., 1505 Race St.

SHOPS AND FOUNDRIES

BIDS ASKED

N. Y., Brooklyn — SHOP and GARAGE — Dietrich Wortmann, archts., 116 Lexington Ave., New York, taking bids on separate contracts 2 story, 100 x 299 ft. shop and garage, Henry and Calyes Sts., for Standard Oil of New York, 26 Bway., New York. $160,000.

CONTRACTS AWARDED

N. Y., Brooklyn—SHOP, etc.—R. H. Macy & Co., 34th St. and Bway., New York, 153 x 256 ft. shop and garage, to H. E. Mitler, 505 5th Ave., New York. Contractor now taking bids on separate contracts. Noted Sept. 11.

POWER PLANTS

PROPOSED WORK

N. Y., Flushing—Queensboro Hill Community Church, R. Anderson in charge, 5812 134th St., sketches by W. B. Willis, assoc. archt., 171 Madison Ave., New York., 1½ story, 38 x 55 ft. boiler room and coal storage, 138th St. and 60th Ave. $45,000.

Okla., Hominy—City preliminary plans electric light plant. $50,000. A. Blackburn, city clk.

Wis., Milwaukee—See "Schools."

British Columbia—National Utilities Corp., subsidiary British Columbia Electric Railway Co. Ltd., 425 Carrall St., Vancouver, applied to Provincial Water Bd. for right to divert 400 sec.-ft. from Sproat River to give power for hydro-electric project, initial scheme 1,000 hp. in Alberni and Port Alberni, dists.

BIDS ASKED

Minn., Wells—Sept. 26, by Village, power plant, incl. 3 diesel engine generating units, switchboard, and complete electric distribution system. $25,000. G. M. Orr & Co., 406 Baker Bldg., Minneapolis, engr.

O., Cincinnati—Sept. 23, by A. T. Conner, supt. Dpt. P. Wks., Columbus, 84 x 105 ft. brick, steel, concrete power house, 47 ft. high, at Longview State Hospital, for Dpt. Welfare, 9th and Oak Sts., Columbus. $65,000. T. R. Ridley, Ohio-Hartman Bldg., Columbus, archt.

CONTRACTS AWARDED

Neb., Omaha—Home for Deaf c/o O. R. Shatto, secy., State Bd. Control, 1 story, brick, concrete power plant, to John Laf & Son, 2012 Lake St., $29,337.

N. J., Sewaren—Shell Eastern Petroleum Products Co., 122 East 42nd St., New York general contract 5 and 6 story, basement, 180 x 430 ft., brick, steel boiler house, power unit, compounding tank rooms, to Cross & Roberts, Inc., Statler Bldg., Boston, Mass. Est. $150,000 or more. Noted July 10.

N. C., Wilson—City, constructing brick, terra cotta addition to power plant to Beaman & Coleman Constr. Co., Lawyers Bldg., Raleigh, $46,850; piping, to McClelland Co., Charlotte, $16,360.

WAREHOUSES

BIDS ASKED

N. J., Newark—See "Contracts Awarded."

N. Y., Brooklyn—Sept. 25, by P. F. Reilly & Sons, 491 Bergen St., 9 story, 60 x 100 ft. storage, Bergen St. and 6th Ave. $150,000. F. P. Lewis, 51 East 42nd St., New York, archts. Noted Sept. 11.

CONTRACTS AWARDED

N. J., Newark—J. Berkowitz, Inc., 359 Plane St., 3 story, basement, 170 x 475 ft., brick, steel warehouse addition, separate contracts. $150,000. S. Cohen, 134 Branford Pl., archt.

Pa., Phila. — Pennsylvania R.R. Co., T. J. Skillman, ch. engr., Broad Street Station, 17th and Arch Sts., 3 story, 202 x 388 ft., rein.-con., brick, caisson found., 38th St. and George Ferry Rd., to Turner Constr. Co., 1700 Walnut St. Est. $500,000. Noted Aug. 28.

Wis., Milwaukee — Crane Co., 830 South Michigan Blvd., Chicago, Ill., 2 story, basement, 74 x 200 ft. warehouse, Capitol St., to W. W. Oelflein, Inc., 110 East Wisconsin St. Est. $115,000.

See proposal advertising on page 108

Constr. News page 123

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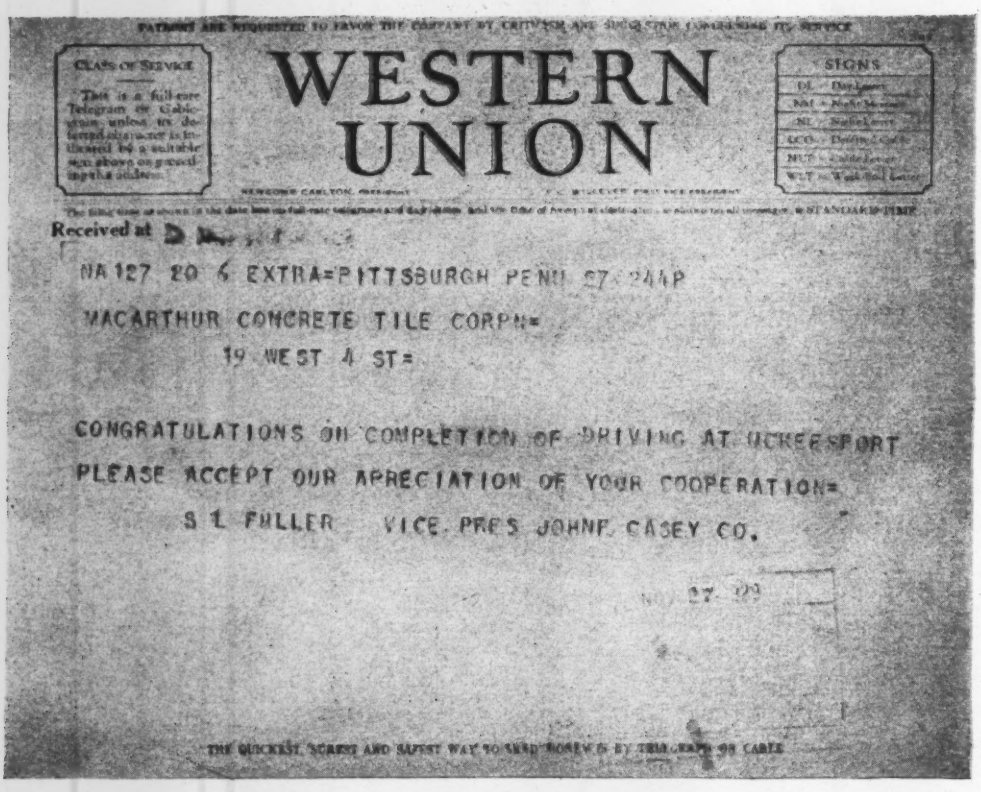

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